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- Using Apple's UniDisk 3.5
- Creating Spreadsheet Templates
- Review of "Pascal 1.3"

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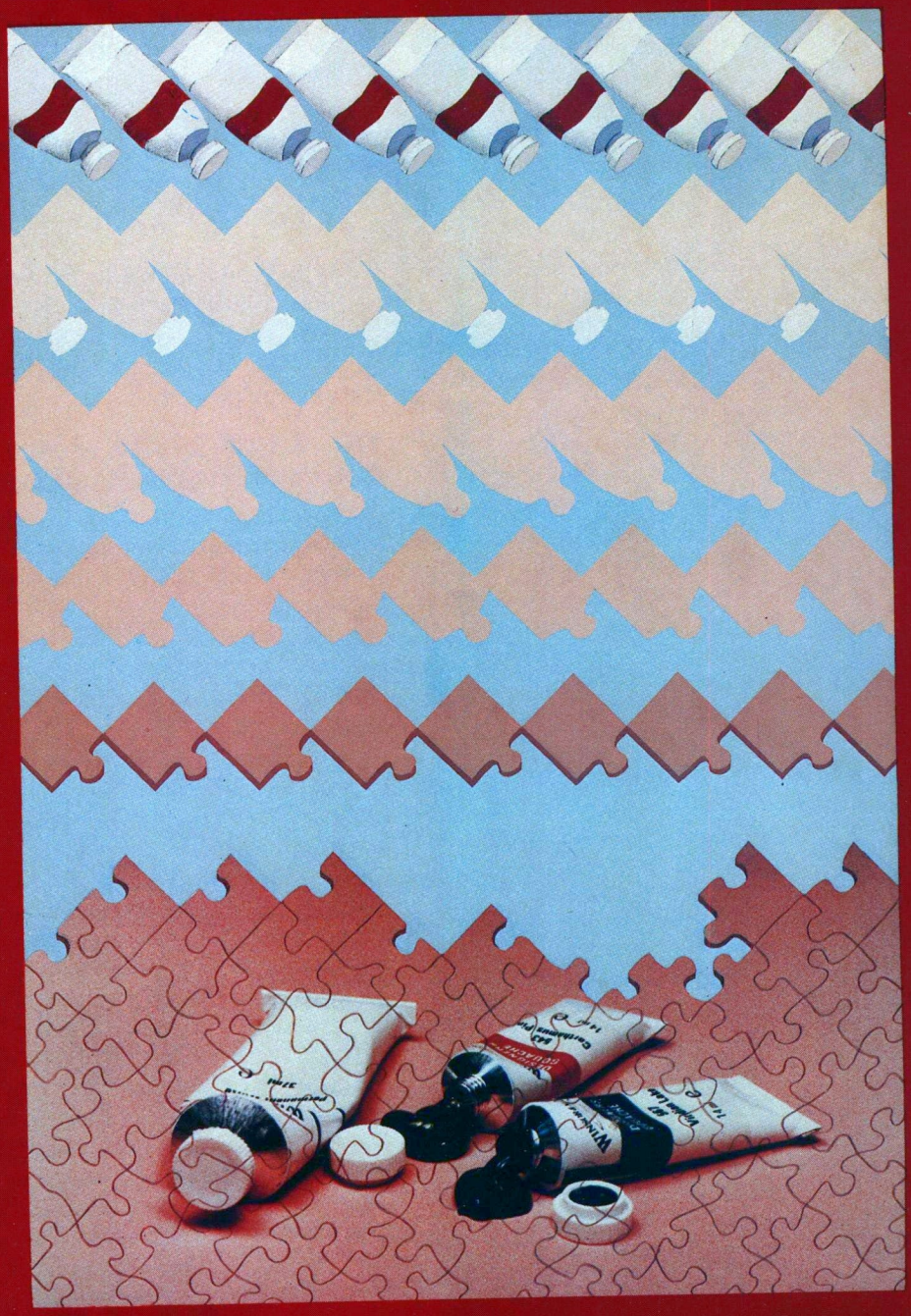

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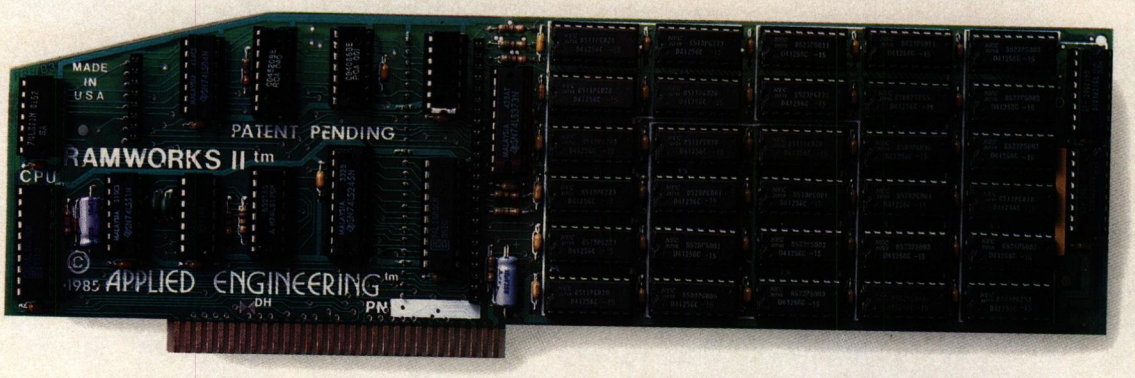
The Best Selling, Most Compatible, Most Recommended, Most Expandable Card Available.



64K to 16 MEG! RamWorks II Is Number One.

It's simple, RamWorks II sells the most because it does the most.

The AppleWorks Amplifier.

While RamWorks II is recognized by all memory intensive programs, NO other expansion card comes close to offering the multitude of enhancements to AppleWorks that RamWorks II does. Naturally, you'd expect RamWorks II to expand the available desktop, after all Applied Engineering was a year ahead of everyone else *including Apple* in offering more than 55K in AppleWorks and we still provide the largest AppleWorks desktops available. But a larger desktop is just part of the story. Just look at all the AppleWorks enhancements that even Apple's own card does not provide and *only* RamWorks II does. With a 256K or larger RamWorks II, all of AppleWorks will automatically load itself into RAM dramatically increasing speed by eliminating all the time required to access the program disk drive. Now switch from word processing to spreadsheet to database at the speed of light with no wear on disk drives.

Only RamWorks II eliminates AppleWorks' internal memory limits, increasing the maximum number of records available from 1,350 to over 15,000. *Only* RamWorks II increases the number of lines permitted in the word processing mode from 2,250 to over 15,000. And *only* RamWorks II (256K or larger) offers a built-in printer buffer, so you won't have to wait for your printer to stop before returning to AppleWorks. RamWorks II even expands the clipboard. And auto segments large files so they can be saved on two or more disks.

RamWorks II, nothing comes close to enhancing AppleWorks so much.

The Most Friendly, Most Compatible Card Available.

Using RamWorks II couldn't be easier because it's compatible with more off-the-shelf software than any other RAM card. Popular programs like AppleWorks, Pinpoint, Catalyst, MouseDesk, Howard-Soft, FlashCalc, The Spread Sheet, Managing Your Money, SuperCalc 3a, and MagiCalc to name a few (and *all* hardware add on's like ProFile and Sider hard disks). RamWorks II is even compatible with software written for Apple cards. But unlike other cards, RamWorks II plugs into the IIe auxiliary slot providing our super sharp 80 column text in a completely integrated system while leaving expansion slots 1 through 7 available for other peripheral cards.

Highest Memory Expansion.

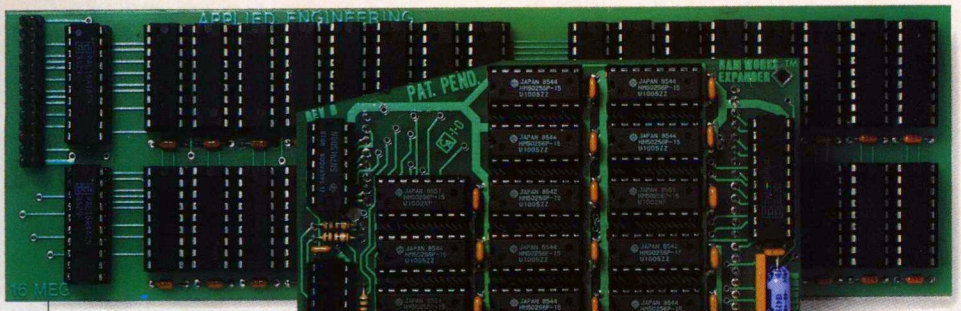
Applied Engineering has always offered the largest memory for the IIe and RamWorks II continues that tradition by expanding to 1 full MEG on the main card using standard RAMs, more than most will ever need (1 meg is about 500 pages of text)...but if you do ever need more, RamWorks II has the widest selection of expander cards available. Additional 512K, 2 MEG, or multiple 16 MEG cards just snap directly onto RamWorks II by plugging into the industry's only low profile (no slot 1 interference) fully decoded memory expansion connector. You can also choose non-volatile, power independent expanders allowing permanent storage for over 20 years.

It Even Corrects Mistakes.

If you've got some other RAM card that's not being recognized by your programs, and you want RamWorks II, you're in luck. Because all you have to do is plug the memory chips from your current card into the expansion sockets on RamWorks II to recapture most of your investment!

The Ultimate in RGB Color.

RGB color is an option on RamWorks II and with good reason. Some others combine RGB output with their memory cards, but that's unfair for those who don't need RGB *and* for those that do. Because if you don't need RGB Applied Engineering doesn't make you buy it, but if you want RGB output you're in for a nice surprise because the RamWorks II RGB option offers better color graphics plus a more readable 80 column text (that blows away any composite color monitor). For only $129 it can be added to RamWorks II, giving you a razor sharp, vivid brilliance that most claim is the best they have ever seen. You'll also appreciate the multiple text colors (others only have green) that come standard. But the RamWorks II RGB option is more than just the ultimate in color output because unlike others, it's fully



16 MEG Expander

512K Expander

compatible with all the Apple standards for RGB output control, making it more compatible with off-the-shelf software. With its FCC certified design, you can use almost any RGB monitor because only the new RamWorks II RGB option provides both Apple standard and IBM standard RGB outputs (cables included). The RGB option plugs into the back of RamWorks II with no slot 1 interference (works on the original RamWorks, too) and remember you can order the RGB option with your RamWorks II or add it on at a later date.

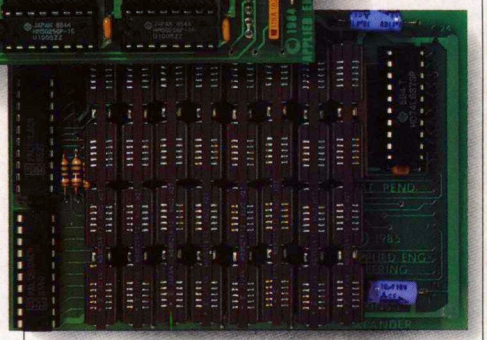
True 65C816 16 Bit Power.

RamWorks II has a built-in 65C816 CPU port for direct connection to our optional 65C816 card. The only one capable of linearly addressing more than 1 meg of memory for power applications like running the Lotus 1-2-3™ compatible program, VIP Professional. Our 65C816 card does not use another slot but replaces the 65C02 yet maintains full 8 bit compatibility.

Endorsed by the Experts.

Steve Wozniak, creator of the Apple Computer said "I wanted a memory card for my Apple that was fast, easy to use, and very compatible; so I bought RamWorks." A+ magazine said "Applied Engineering's RamWorks is a boon to those who must use large files with AppleWorks...I like the product so much that I am buying one for my own system." inCider magazine said "RamWorks II is the most powerful auxiliary slot memory card available for your IIe, and I rate it four stars...For my money, Applied Engineering's RamWorks II is king of the hill."

Apple experts everywhere are impressed by RamWorks II's expandability, versatility, ease of use, and the sheer power and speed that it adds to any IIe. With a RamWorks II in your Apple, you'll make IBM PC's and AT's look like slowpokes.



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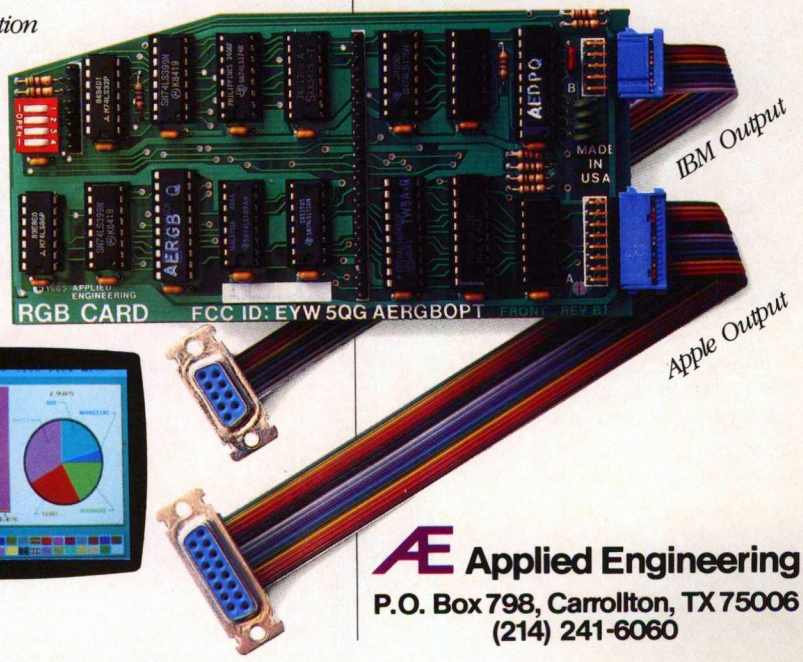
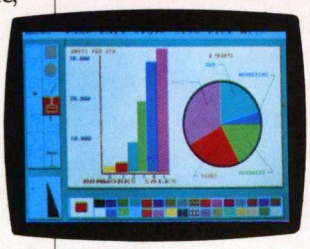
- The only large RAM card that's 100% compatible with all IIe software

RGB Option





- RamDrive™ the ultimate disk emulation software included free
- Memory is easily partitioned allowing many programs to be in memory at once
- Compatible, RGB option featuring ultra high resolution color graphics and multiple text colors, with cables for both Apple and IBM type monitors
- Built-in self diagnostics software
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- Software industry standard
- Advanced Computer Aided Design
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VOLUME 9, NUMBER 5 MAY 1986

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Features

Quicksilver • Jenny Schmidt 12
This novel approach to screen graphics will leave you shimmering with delight

Apple's New UniDisk • Cecil Fretwell 20
Installing and using the latest 3.5 inch disk drive for the Apple II

Issues in Using Spreadsheets—Part 1 • Jeffrey M. Jacques 25
Guidelines for avoiding a tempest in a template

Review of "Apple Pascal 1.3" • Donald J. Geenen 30
A significant upgrade in this popular programming environment

Treesearch for Pascal 1.3 • David G. Sparks 46
What's missing from the newest version of Pascal? This program fills in the gap

Letters

A.P.P.L.E. Doctor • Bruce F. Field 50
Advice from a "board-certified" specialist

Write-A.P.P.L.E. 54
Readers' Forum

Departments

A.P.P.L.E. Co-op New Products and Specials 5

The INNER CIRCUIT • Don Elman 8
Changing before our eyes

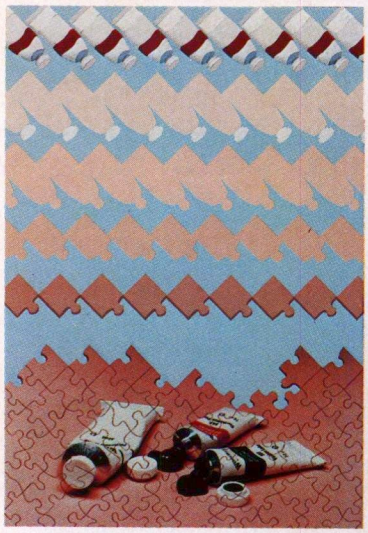
Member Services 8

Member Billboard 9
Co-op information

A.P.P.L.E. Consultants List 10

The Marketplace 57
New products and developments for the Apple

Unclassifieds 62



ABOUT THE COVER

The more things change, the better they become. Illustration by Michele Green, Cornish Institute, Seattle, Washington.

ADVERTISER INDEX

Applied Engineering 2,3,31, 32,33,34, 35,68
Beagle Bros. 11,53
Blankenship & Associates 62
Cauzin Systems 40,41,42 43,44,45
CDA Computer Sales 54
Central Point Software 65
CMC Computer Systems 59
Coit Valley Computers 7
Computer Direct 16,17
David Data 52
Harvest Software 62
H & M Disk Drives 61
kyan software 29
Laing Electronics 39
Legend Industries 19
Memory Plus Distributors 56
MGR Software 10
Micol Systems 38
Micro Prose 49
MicroSPARC/Nibble 58
Nordic Software 49
Northeastern Software 36,37
Norwich Data Services 60
Pinpoint Publishing 67
SC Software Corporation 55
Silicon Express 51
Soft Wear Company 21
Southern California Research Group 47
Titan Technologies 66
VF Associates 61
Vilberg Brothers Computing 56

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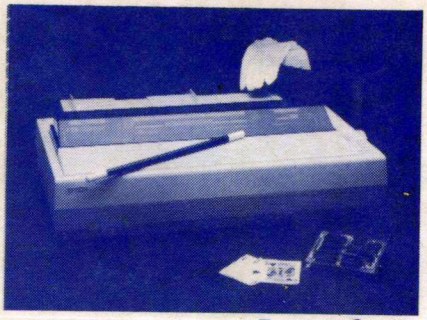

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•DX-10	Letter Quality	Parallel
•DX-20	Letter Quality	Parallel/Serial
•FX-85	Dot Matrix	Parallel
•HI-80	Plotter	
•HS-80	Ink Jet	Parallel
•LX-80	Dot Matrix	Parallel
•FX-286	Fast Dot Matrix	Parallel
•LQ800	24 Pin Dot Matrix	Parallel/Serial
•LQ1000	24 Pin Dot Matrix	Parallel/Serial
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TALLY		
•MT85		Parallel or Serial or Imagewriter Serial
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The INNER CIRCUIT

Don Elman

Transitions

If you've owned your computer for a while, take a moment to reflect on how things have changed since you bought it. My first personal computer–whose brand and model shall go unnamed here–contained a whopping 5K RAM (expandable to a breathtaking 32K), had 22-column screen output, an excruciatingly slow tape drive, and minimal compatibility with other brandmates. Yet its rudimentary sound and color output capabilities, along with its easy-to-edit, built-in BASIC, were enough to keep me and my family tied to the keyboard (or joystick) for extended periods of time.

Today, just a few years later, even 128K is often considered too small for full functionality. Anything less than an 80-column screen is scoffed at, and typical sound output can approach orchestral complexity. Those snail-like, semi-reliable tape drives are all but forgotten in the wake of rapid hard disks and mega-storage CD-ROM's. Applesoft and similar BASIC's are being attacked from all sides as too slow or unstructured. The pseudo-word, typed commands which used to be considered the height of user-friendliness are being driven out by little rolling rodents, cute graphic icons, and–on the horizon–natural-language voice recognition.

When will microcomputers reach that final stage of maturity where change comes to a halt, technology stabilizes, and the innovators go on to other pursuits? The only message we get from our crystal ball is that the best is yet to come.

In This Issue

The theme of transformation and evolution underlies this month's group of features. **Quicksilver** by Jenny Schmidt is a clever program that first allows you to create two entirely different screen drawings, then smoothly transmutes one

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into the other right before your eyes. Our hardware focus, by Cecil Fretwell, puts the spotlight on **Apple's New Unidisk**, the 3.5 inch drive that is being promoted as a higher form of memory storage for your Apple II. His article may help you decide whether to take the leap now, or wait for survival of the fittest. Our long-time spreadsheet expert, Jeffrey Jacques, begins a new series on approaches to developing templates, **Issues in Using Spreadsheets**, aimed at novices as well as more advanced users. Two articles look at new developments in one of the most popular "alternate" programming languages for the Apple II. Donald J. Geenen presents a thorough, enthusiastic review of **Apple Pascal 1.3**, and David Sparks provides a **Treesearch** routine that fills a gap in the genetic structure of this newest Pascal version.

We hope this natural selection of articles–along with our pervasive species of letters, tips, and new products–will help your computer's utility evolve to its highest possible level.

MEMBER BILLBOARD

The Lowdown on Labels

If you receive your magazine by mail, then there is one little item attached each month that is easy to overlook but which contains some very important information about your status as a member or subscriber. Please take a moment to examine your mailing label. First, carefully check to make sure that your name, address, city, state, and ZIP code are correct. If there is any error, you'll do us all a favor by writing or calling our Customer Services department, who will promptly update our computer records, and the change should appear on your label within about two months.

Next, take a look at the top line. For all U.S. addresses, the middle part of this line is information that relates to the bulk-mail sorting process, which saves both mailing time and money. The information on the upper right shows your unique member or subscriber number and the expiration month. In general, membership numbers are assigned sequentially as people join, and are currently closing in on the 40,000 mark. (We frequently encounter long-time members who proudly sport numbers in the triple digits or lower as a true badge of prestige!) Certain ranges of numbers, such as those starting with "9," are reserved for institutional members or exchange subscriptions with other publications.

The seemingly clear-cut expiration date probably generates more confusion than any other part of the label. Basically it indicates the month during which your last magazine issue will be sent if you fail to renew. However, the cover date of that last issue will be one month later. For example, if your expiration is November 1986, then your last issue will be the one called "December 1986", which is mailed in November. In practice, we usually allow one additional month's grace period beyond that to assure continuity of your subscription if you renew at the last minute. But please don't take any chances, because once you have been placed in the "inactive" category, it may take as much as two months to reactivate.

Another point of confusion stems from the fact that a magazine's production and distribution schedule requires each month's labels to be printed about 6 weeks before you receive the issue. For example, labels for the May issue were actually printed around the 15th of March. Only active members/subscribers whose names were in our computer on that date could be included in the May issue bulk mailing. Thus, any new names or address changes entered after that time would take effect no earlier than the June issue. We hope this gives you a better understanding of the significance of the mailing label information, and appreciate your cooperation whenever problems arise.

Reader's Choice Card Winners

During the annual membership meeting, a special double drawing was made from the Reader's Choice cards. Congratulations to Dewey Keen of Swartz Creek, Michigan and to John C. Schmidt of San Marcos, Texas!

An Important Announcement from Apple Computer, Inc.

Apple Computer recently announced the Lisa/Macintosh XL Trade-in Program. Since the announcement, we have received a positive response from Macintosh XL and Lisa users in support of the program.

Several unique factors contributed to Apple's decision to offer the trade-in, but the one overriding factor is that Apple feels a special commitment to our customers who supported Apple in a new and different product direction.

Those of you who want to continue using your Lisa or Macintosh XL should know that you own the most powerful Macintosh workstation Apple has ever sold. **Apple will continue to service and support your hardware and software for five years.** In addition, we will be providing additional technical support and training to our servicing Lisa/Macintosh XL dealers so that they can continue to handle your support needs.

For those of you interested in migrating to the new Macintosh Plus and Hard Disk 20, Apple is offering any Lisa or Macintosh XL owner a special trade-in offer. The suggested retail price of these products is $4098.00; however, **when you trade in your Lisa or Macintosh XL the suggested retail price is only $1498.00.**

In addition, if you had AppleCare for your system and decide to participate in the trade-in, your **AppleCare coverage can be automaticallfy transferred over to your new Macintosh Plus and Hard Disk 20 at no additional charge.**

The trade-in program is available through participating authorized Apple Macintosh dealers from **April 14, 1986 through August 29, 1986.** For complete details on each program and how to participate, please contact the participating authorized Apple dealer nearest you. The names of participating dealers are available by calling **800-538-9696 (extention 874).** You may also call this number for the names of dealers who are servicing and supporting Lisa/Macintosh XL systems.

We thank you for your support and hope that you, and all the members of your group, continue to enjoy your Apple products.

Apple Computer and MS-DOS

John Sculley, CEO and board chairman of Apple Computer, Inc. has committed the company to meet the needs of corporate PC users, guaranteed that MS-DOS will run on future products, as reported in an exclusive interview with *PC Week*. He said Apple is "going to make every effort to be as good at implementing capability at the systems level as IBM," and explained that "Apple is not pushing MS-DOS, but is focussing on customer solutions," and "it will be an option; it will not be something standard unless someone wants it."

In explaining about future plans centering around a "true family of workstations. We have the entry product, a Mac 512K, which is more portable, and the more powerful Plus. The Open Mac (reportedly due out in about a year) will be more than a Mac with slots in it."

"We're doing things we've never done before," he said. "I've tried to temper the expectations so that we can build a track record that is very credible. When we say we are going to do something, we actually end up doing it. I think it's the maturity that people have been looking for from Apple and it's one of the things that is going to help us be successful."

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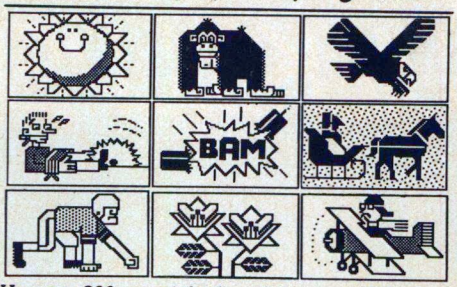

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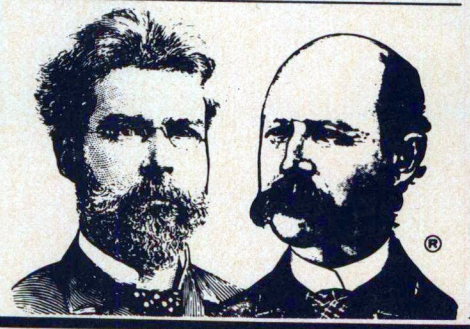
"The Print Shop" is a trade mark of Broderbund Software, Inc.



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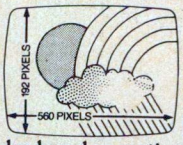

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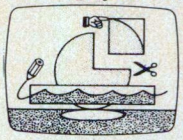

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```
]LIST
10 HGR2: CLEAR: ONERR GOTO 10
20 P=1+(P=1): POKE 49238-P,Z
30 POKE 230,32+P: POKE 28,C
40 CALL-3082: POKE 49235+P,Z
50 C=C+1: GOTO 20
```

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CIRCLE 9 READER SERVICE CARD

QUICKSILVER

Jenny Schmidt

YOU cannot turn on the television these days without seeing examples of computer graphics. Station identifications, commercials, and program credits are using some really amazing effects. This type of graphics is usually produced on large mainframe computers and may take several months of hard work just to produce a thirty second film. Even though you do not have a mainframe in your living room, you may produce some neat effects on your Apple II. This article and the following program will explain and demonstrate a graphic effect that I call the quicksilver effect.

The quicksilver effect starts with a line drawing that smoothly transforms into another line drawing. The viewer sees a picture shift and deform into an entirely new picture before your eyes. The program QUICKSILVER will let you experiment with this effect. After experimentation, you will be able to add the quicksilver effect to your programs. The quicksilver program is entirely menu driven and fully error trapped. When you run QUICKSILVER, you will see the menu at the bottom of the screen which looks like this:

```
< PIC1 > PIC2 LINES CLEAR
  SHIFT LOAD SAVE QUIT
```

The brackets around PIC1 show that this option may be selected. The left and right arrow keys move the brackets to different options. Pressing the return key selects the option inside the brackets.

The Program's Options

A brief discussion of these options is in order. PIC1 and PIC2 select between the initial and final pictures. Work on the initial picture may be chosen by selecting PIC1. PIC1 will then be displayed in inverse to let you know that you are working on the initial picture. Similarly, selecting PIC2 chooses the final picture. LINES allows you to enter line drawings. CLEAR erases the picture selected by PIC1 or PIC2. SHIFT executes the quicksilver effect. LOAD allows you load a line drawing file from disk. SAVE lets you save a line drawing. Finally, QUIT exits the program.

A typical session with QUICKSILVER begins by selecting PIC1 and then selecting LINES to enter the lines for the initial picture. Once the lines for the initial drawing have been entered, you then select PIC2 for the final picture. Next, select LINES again and enter lines for the final picture. After all the lines for the final picture have been entered, you are ready to see the quicksilver effect by selecting SHIFT.

When you select LINES, you enter into the lines menu. Now you are able to draw lines for the picture selected by PIC1 or PIC2. The lines menu looks like this:

```
  LINE:138,78
UP PIN ADD ERASE QUIT
DOWN INCR DECR VIEW
*
```

You will also see a cursor in the middle of the screen. You may move the cursor with the 'I','J','K', and 'M' keys. These keys move the cursor in the direction suggested by their positions on the keyboard. For example, the 'I' key moves the cursor up one plotting point. The cursor may be moved in larger increments by selecting the INCR option. Each time this option is selected, the

number of asterisks at the bottom of the screen is increased by one. The cursor moves as many plotting points as there are asterisks on the screen. Similarly, selecting DECR decreases the number of plotting points the cursor moves each time.

The coordinates of the cursor are displayed in the upper right portion of the menu. Once you move the cursor to the proper position on the screen you are ready to plot a line. Select PIN. This option pins down the beginning of the line. As you now move the cursor, you will see a line from the pinning point to the cursor. The coordinates of the line are now displayed in the upper right portion of the screen. Move the cursor until you produce the line you want and select ADD. The line is then made permanent and added to the list of lines. The coordinates of the last line added is displayed in the upper left portion of the menu. After you select ADD, the cursor becomes unpinned again. You may add more lines by moving the cursor, selecting PIN, moving the cursor, and then selecting ADD. You may add up to 100 lines for each picture.

Occasionally, you will need to see the portion of the screen obscured by the menu. Selecting VIEW will display that portion of the screen. With this option you are able to see the cursor as you move it in that portion of the screen. When you want to see the menu again, press return. (Actually the obscured menu is still there, and you are really reselecting VIEW in order to see the menu again. If you had moved the brackets while viewing the lower portion of the screen, you would select an entirely different option when you press return. Thus, it is best not to use the arrow keys when you are not viewing the menu.)

Sometimes you will select ADD and then change your mind. Selecting ERASE will remove the line you just added. Sometimes you will realize that a line in your drawing is not right and you want to remove it. The UP and DOWN options will step you up and down through the line list. The upper left portion of the menu will display the coordinates of each line as you step through the line list. Also the corresponding line will flash on the screen. When you find the offending line, you may remove it by selecting ERASE. Any subsequent lines added will be added at the end of the line list.

Finally, selecting QUIT will return you to the main menu.

Viewing the Quicksilver Effect

When you have completed both the line list for the initial picture and for the final picture, you are ready to see the quicksilver effect. Select SHIFT. After the quicksilver effect, the program will display whichever picture is selected by PIC1 or PIC2. You may then continue adding lines to pictures and exploring the quicksilver effect.

If you want to save a picture, select SAVE. You will be asked for a file name. Typing '?' instead will display the catalog. Pressing return will send you back to the menu. Entering a file name will save the line file of the picture selected by PIC1 or PIC2. Selecting LOAD will let you load a line file. This option works in much the same way as SAVE.

To use the QUICKSILVER program you will have to enter and save the Applesoft listing (Listing 1) and the machine code listing (Listing 2). You can save the machine code with BSAVE SILVER,A$9200,L$3F6. Removing your typo's from the QUICKSILVER program may be difficult as a result of the error trapping in the program. It is best to delete line ten of the program so that the program will halt and display error messages as they appear. Once you remove your typing mistakes you may add line ten. Also, the program itself changes some of the Applesoft pointers and therefore the program cannot be modified after it is run. Thus, when you encounter an error while you run the program, you should type FP to reset the pointers. Then reload the program and fix the problem in the program. Finally save the program, and then you are ready to run it again.

Adding Quicksilver To Your Programs

If you want to add the quicksilver effect to your own programs, follow the example given in the demo program (Listing 3). The two line lists are loaded into eight integer arrays, and the shorter list is padded out to equal the longer. Then the high resolution screen is initialized and the call to the machine code routine is given.

Understanding just how the quicksilver effect is achieved is easiest with an example. Consider an initial picture composed of a single line and a final picture composed of another single line. To transform the first line into the second, draw an imaginary line from the top of the first line to the top of the second line. Draw a second imaginary line from the bottom of the first line to the bottom of the second line. Now, each transformation of the initial line will make a line extending from the top imaginary line to the bottom imaginary line. The transformation will start closest to the initial line and then travel along the imaginary lines to the final line (See Figure 1). In pictures with more than one line, each line in the initial picture is matched with a line in the final picture. Each initialline is then transformed by the method described above into the final picture.

LISTING 1

```
10  ONERR  GOTO 1630
20  IF  PEEK (104) <  > 96 THEN  POKE 103,1: POKE 104,96: POKE 24576,0: PRINT
     CHR$ (4)"RUN QUICKSILVER"
30  HOME : VTAB 10: HTAB 15: PRINT "QUICKSILVER": PRINT : HTAB 19: PRINT "
    BY": PRINT : HTAB 14: PRINT "JENNY SCHMIDT"
40  POKE 105,0: POKE 106,9: POKE 107,0: POKE 108,9: POKE 109,0: POKE 110,8
    : POKE 111,0: POKE 112,32: POKE 115,0: POKE 116,32
50  D$ =  CHR$ (4): SCALE= 1: ROT= 0
60  PRINT D$"BLOAD SILVER"
70  DIM X0%(100),Y0%(100),X1%(100),Y1%(100),X2%(100),Y2%(100),X3%(100),Y3%
    (100)
80  DATA  1,0,4,0,58,32,169,6,0,104,168,104,166,223,154,72,152,72,96
90  FOR W = 0 TO 18: READ I: POKE 768 + W,I: NEXT W
100  POKE 232,0: POKE 233,3
110 PC = 1:PT = 0:L1 =  - 1:L2 =  - 1:SZ = 1:V = 0
120  HGR : HCOLOR= 3: GOSUB 1570
130  HOME : HTAB 1: VTAB 21: PRINT " PIC1":: HTAB 9: PRINT " PIC2":: HTAB
     17: PRINT " LINES":: HTAB 25: PRINT " CLEAR";
140  VTAB 23: HTAB 1: PRINT " SHIFT":: HTAB 9: PRINT " LOAD ":: HTAB 17: PRINT
     " SAVE":: HTAB 25: PRINT " QUIT";
150  IF PC = 1 THEN  VTAB 21: HTAB 2: INVERSE : PRINT "PIC1":: NORMAL
160  IF PC = 2 THEN  VTAB 21: HTAB 10: INVERSE : PRINT "PIC2":: NORMAL
170  REM  SELECT OPTION
180 CX = 1:CY = 21
190  POKE  - 16368,0
200  HTAB CX: VTAB CY: PRINT ">";: HTAB CX + 7: PRINT "<";
210  IF  PEEK ( - 16384) < 128 THEN 210
220 KY =  PEEK ( - 16384)
230  POKE  - 16368,0
240  IF KY <  > 149 THEN 280
250  HTAB CX: VTAB CY: PRINT " ";: HTAB CX + 7: VTAB CY: PRINT " ";:CX = C
     X + 8
260  IF CX  > 25 THEN CX = 1:CY = CY + 2: IF CY > 23 THEN CY = 21
270  GOTO 200
280  IF KY  <  > 136 THEN 310
290  HTAB CX: VTAB CY: PRINT " ";: HTAB CX + 7: VTAB CY: PRINT " ";:CX = C
     X  - 8: IF CX < 1 THEN CX = 25:CY = CY - 2: IF CY < 21 THEN CY = 23
300  GOTO 200
310  IF KY = 141 THEN  ON ((CY - 21) / 2) * 4 + (CX - 1) / 8 + 1 GOTO 340,
     360,380,1170,1230,1320,1430,1540
320  GOTO 200
330  REM  PIC1
340 PC = 1:J = L1: VTAB 21: HTAB 2: INVERSE : PRINT "PIC1":: NORMAL : HTAB
     10: PRINT "PIC2":: HGR : HCOLOR= 3: GOSUB 1580: GOTO 200
350  REM  PIC2
360 PC = 2:J = L2: VTAB 21: HTAB 10: INVERSE : PRINT "PIC2":: NORMAL : HTAB
     2: PRINT "PIC1":: HGR : HCOLOR= 3: GOSUB 1600: GOTO 200
370  REM  LINES
380  HOME : VTAB 22: HTAB 2: PRINT "UP":: HTAB 10: PRINT "PIN":: HTAB 18: PRINT
     "ADD":: HTAB 26: PRINT "ERASE":: HTAB 34: PRINT "QUIT":: VTAB 23: HTAB
     2: PRINT "DOWN":: HTAB 10: PRINT "INCR":: HTAB 18: PRINT "DECR":: HTAB
     26: PRINT "VIEW";
390  HGR : HCOLOR= 3: GOSUB 1570
400 BX = 1:BY = 22:JX = 138:JY = 78:HX = JX:HY = JY:ER = 0
410  VTAB 24: HTAB 1: FOR W = 1 TO SZ: PRINT "*";: NEXT W
420  POKE  - 16368,0
430  HTAB BX: VTAB BY: PRINT "<";: HTAB BX + 7: PRINT ">";
440  XDRAW 1 AT JX,JY
450  IF PN = 1 THEN  VTAB 21: HTAB 21: PRINT "                    ";: VTAB
     21: HTAB 21: PRINT "LINE:";HX;",";HY;",";JX;",";JY;: REM 20 SPACES

460  IF PN = 0 THEN  VTAB 21: HTAB 21: PRINT "                    ";: VTAB
     21: HTAB 21: PRINT "LINE:";JX;",";JY;: REM 20 SPACES
470  IF  PEEK ( - 16384) > 127 THEN 510
480  IF ER = 1 AND PC = 1 AND L1 >  - 1 THEN  HCOLOR= 0: HPLOT X0%(J),Y0%(
     J) TO X1%(J),Y1%(J): HCOLOR= 3: HPLOT X0%(J),Y0%(J) TO X1%(J),Y1%(J)
490  IF ER = 1 AND PC = 2 AND L2 >  - 1 THEN  HCOLOR= 0: HPLOT X2%(J),Y2%(
     J) TO X3%(J),Y3%(J): HCOLOR= 3: HPLOT X2%(J),Y2%(J) TO X3%(J),Y3%(J)
500  GOTO 470
510  XDRAW 1 AT JX,JY
520 KY =  PEEK ( - 16384)
530  POKE  - 16368,0
540  IF KY = 149 THEN  HTAB BX: VTAB BY: PRINT " ";: HTAB BX + 7: VTAB BY:
     PRINT " ";:BX = BX + 8: IF BX > 33 OR (BX > 25 AND BY = 23) THEN BX =
     1:BY = BY + 1: IF BY = 24 THEN BY = 22
550  IF KY = 136 THEN  HTAB BX: VTAB BY: PRINT " ";: HTAB BX + 7: VTAB BY:
     PRINT " ";:BX = BX  - 8: IF BX < 0 THEN BX = 33:BY = BY - 1: IF BY <
     22 THEN BY = 23
560  IF BX = 33 AND BY = 23 THEN BX = 25
570  IF KY = 141 THEN  ON (BY - 22) * 5 + (BX - 1) / 8 + 1 GOSUB 660,710,7
     40,840,1000,1020,1080,1110,1140
580  IF (KY = 201 OR KY = 202 OR KY = 203 OR KY = 205) AND PN = 1 THEN  CALL
     38179,HX,HY,JX,JY:
590  IF KY = 201 THEN JY = JY - SZ: IF JY < 0 THEN JY = 191 + JY
600  IF KY = 205 THEN JY = JY + SZ: IF JY > 191 THEN JY = JY - 191
610  IF KY = 202 THEN JX = JX - SZ: IF JX < 0 THEN JX = 279 + JX
620  IF KY = 203 THEN JX = JX + SZ: IF JX > 279 THEN JX = JX - 279
630  IF (KY = 201 OR KY = 202 OR KY = 203 OR KY = 205) AND PN = 1 THEN  CALL
     38179,HX,HY,JX,JY
```

```
640  GOTO 430
650  REM  UP
660 J = J - 1:ER = 1: IF J < 0 THEN J = 0: RETURN
670  IF PC = 2 THEN 690
680  VTAB 21: HTAB 1: PRINT "                              ";: HTAB 1: PRINT J;": ";
     X0%(J);",";Y0%(J);",";X1%(J);",";Y1%(J);: RETURN : REM 20 SPACES
690  VTAB 21: HTAB 1: PRINT "                              ";: HTAB 1: PRINT J;": ";
     X0%(J);",";Y0%(J);",";X1%(J);",";Y1%(J);: RETURN : REM  20 SPACES
700  REM  PIN
710 ER = 0: IF PN = 1 THEN  CALL 38179,HX,HY,JX,JY
720 PN = 1:HX = JX:HY = JY: RETURN
730  REM  ADD
740  IF PN = 0 THEN  RETURN
750 PN = 0: VTAB 21: HTAB 1: PRINT "                                  ";: HCOLOR= 3: HPLOT
     HX,HY TO JX,JY: REM 20 SPACES
760  HTAB 1: IF PC = 2 THEN 800
770 L1 = L1 + 1:J = L1
780  IF L1 > 100 THEN L1 = 100
790 X0%(L1) = HX:Y0%(L1) = HY:X1%(L1) = JX:Y1%(L1) = JY: PRINT L1;":";" ";
     X0%(L1);",";Y0%(L1);",";X1%(L1);",";Y1%(L1);: RETURN
800 L2 = L2 + 1:J = L2
810  IF L2 > 100 THEN L2 = 100
820 X2%(L2) = HX:Y2%(L2) = HY:X3%(L2) = JX:Y3%(L2) = JY: PRINT L2":";" ";X
     2%(L2);",";Y2%(L2);",";X3%(L2);",";Y3%(L2);: RETURN
830  REM  ERASE
840 ER = 0: IF PC = 2 THEN 920
850  IF L1 =  - 1 THEN  RETURN
860  CALL 38179,X0%(J),Y0%(J),X1%(J),Y1%(J)
870  IF L1 = 0 THEN L1 =  - 1: VTAB 21: HTAB 1: PRINT "
      ";: GOTO 910: REM  20 SPACES
880  IF J = L1 THEN L1 = L1 - 1:J = L1: GOTO 900
890  FOR W = J + 1 TO L1:X0%(W - 1) = X0%(W):Y0%(W - 1) = Y0%(W):X1%(W - 1
     ) = X1%(W):Y1%(W - 1) = Y1%(W): NEXT W:L1 = L1 - 1
900  VTAB 21: HTAB 1: PRINT "                              ";: HTAB 1: PRINT J;": ";
     X0%(J);",";Y0%(J);",";X1%(J);",";Y1%(J);: REM  20 SPACES
910  RETURN
920  IF L2 =  - 1 THEN  RETURN
930  CALL 38179,X2%(J),Y2%(J),X3%(J),Y3%(J)
940  IF L2 = 0 THEN L2 =  - 1: VTAB 21: HTAB 1: PRINT "
      ";: GOTO 980: REM  20 SPACES
950  IF J = L2 THEN L2 = L2 - 1:J = L2: GOTO 970
960  FOR W = J + 1 TO L2:X2%(W - 1) = X2%(W):Y2%(W - 1) = Y2%(W):X3%(W - 1
     ) = X3%(W):Y3%(W - 1) = Y3%(W): NEXT W:L2 = L2 - 1
970  VTAB 21: HTAB 1: PRINT "                              ";: HTAB 1: PRINT J;": ";
     X2%(J);",";Y2%(J);",";X3%(J);",";Y3%(J);: REM 20 SPACES
980  RETURN
990  REM  QUIT
1000  POP :PN = 0: POKE  - 16301,0: GOTO 130
1010  REM  DOWN
1020 J = J + 1:ER = 1: IF PC = 2 THEN 1050
1030  IF J > L1 THEN J = L1: RETURN
1040  VTAB 21: HTAB 1: PRINT "                                  ";: HTAB 1: PRINT J;": "
     ;X0%(J);",";Y0%(J);",";X1%(J);",";Y1%(J);: RETURN : REM  20 SPACES
1050  IF J > L2 THEN J = L2: RETURN
1060  VTAB 21: HTAB 1: PRINT "                              ";: HTAB 1: PRINT J;": "
     ;X2%(J);",";Y2%(J);",";X3%(J);",";Y3%(J);: RETURN : REM  20 SPACES
1070  REM  INCR
1080  IF SZ < 35 THEN SZ = SZ + 1: VTAB 24: HTAB SZ: PRINT "*";
1090  RETURN
1100  REM  DECR
1110  IF SZ > 1 THEN  VTAB 24: HTAB SZ: PRINT " ";:SZ = SZ - 1
1120  RETURN
1130  REM  VIEW
1140  IF V = 0 THEN V = 1: POKE  - 16302,0: RETURN
1150 V = 0: POKE  - 16301,0: RETURN
1160  REM  CLEAR
1170  HOME : VTAB 22: IF PC = 1 THEN  PRINT "DO YOU WANT TO RETAIN PICTURE
      ONE: ";
1180  IF PC = 2 THEN  PRINT "DO YOU WANT TO RETAIN PICTURE TWO: ";
1190  INPUT "";A$: IF A$ = "" OR A$ = "Y" OR A$ =  CHR$ (121) THEN 130
1200  IF PC = 1 THEN L1 =  - 1: GOTO 120
1210 L2 =  - 1: GOTO 120
1220  REM  SHIFT
1230  IF L1 =  - 1 OR L2 =  - 1 THEN  HOME : VTAB 22: INPUT "NO PICTURE TO
      SHIFT-- PRESS RETURN";A$: GOTO 130
1240  IF L1 = L2 THEN 1290
1250  IF L1 > L2 THEN 1280
1260  FOR W = L1 + 1 TO L2:X0%(W) = X0%(W - L1 - 1):Y0%(W) = Y0%(W - L1 -
     1):X1%(W) = X1%(W - L1 - 1):Y1%(W) = Y1%(W - L1 - 1): NEXT W:LL = L2
1270  GOTO 1290
1280  FOR W = L2 + 1 TO L1:X2%(W) = X2%(W - L2 - 1):Y2%(W) = Y2%(W - L2 -
     1):X3%(W) = X3%(W - L2 - 1):Y3%(W) = Y3%(W - L2 - 1): NEXT W:LL = L1
1290  HGR : HGR2 : CALL 37376,X0%,Y0%,X1%,Y1%,X2%,Y2%,X3%,Y3%,LL: ROT= 0
1300  FOR W = 1 TO 2000: NEXT W: GOTO 120
1310  REM  LOAD
1320  TEXT : HOME : VTAB 12: INPUT "ENTER FILE NAME (?=CATALOG) :  ";A$: PRINT

1330  IF A$ = "" THEN 120
1340  IF A$ = "?" THEN  PRINT D$;"CATALOG": GET A$: PRINT A$: GOTO 1320
1350  PRINT D$;"OPEN";A$: PRINT D$;"READ";A$
1360  IF PC = 2 THEN 1390
1370  INPUT L1
1380  FOR W = 0 TO L1: INPUT X0%(W): INPUT Y0%(W): INPUT X1%(W): INPUT Y1%
     (W): NEXT W: GOTO 1410
1390  INPUT L2
1400  FOR W = 0 TO L2: INPUT X2%(W): INPUT Y2%(W): INPUT X3%(W): INPUT Y3%
     (W): NEXT W
1410  PRINT D$"CLOSE": GOTO 120
1420  REM  SAVE
1430  TEXT : HOME : VTAB 12: INPUT "ENTER FILE NAME (?=CATALOG) :  ";A$: PRINT

1440  IF A$ = "" THEN 120
1450  IF A$ = "?" THEN  PRINT D$;"CATALOG": GET A$: PRINT A$: GOTO 1430
1460  PRINT D$;"OPEN";A$: PRINT D$;"WRITE";A$
1470  IF PC = 2 THEN 1500
1480  PRINT L1
1490  FOR W = 0 TO L1: PRINT X0%(W): PRINT Y0%(W): PRINT X1%(W): PRINT Y1%
     (W): NEXT W: GOTO 1520
1500  PRINT L2
1510  FOR W = 0 TO L2: PRINT X2%(W): PRINT Y2%(W): PRINT X3%(W): PRINT Y3%
     (W): NEXT W
1520  PRINT D$"CLOSE": GOTO 120
1530  REM  QUIT
1540  HOME : VTAB 22: INPUT "DO YOU WANT TO CONTINUE?";A$: IF A$ = "" OR  LEFT$
     (A$,1) = "Y" OR  LEFT$ (A$,1) =  CHR$ (121) THEN 130
1550  TEXT : HOME : PRINT  CHR$ (4);"FP"
1560  REM  DRAW PICTURE
1570  IF PC = 2 THEN 1600
1580  IF L1 =  - 1 THEN  RETURN
1590  FOR W = 0 TO L1: HPLOT X0%(W),Y0%(W) TO X1%(W),Y1%(W): NEXT W: RETURN

1600  IF L2 =  - 1 THEN  RETURN
1610  FOR W = 0 TO L2: HPLOT X2%(W),Y2%(W) TO X3%(W),Y3%(W): NEXT W: RETURN

1620  REM  ERROR HANDLING ROUTINE
1630  HOME : VTAB 12: ON  PEEK (222) GOTO 1640,1650,1660,1670,1680,1690,17
     00,1710,1720,1730,1740,1750,1760,1770,1780,1790
1640  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1650  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1660  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1670  PRINT "DISK IS WRITE PROTECTED": GOTO 1800
1680  PRINT "FILE IS NOT ON DISK": PRINT D$;"DELETE";A$: GOTO 1800
1690  PRINT "FILE IS NOT ON DISK": GOTO 1800
1700  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1710  PRINT "I/O ERROR": GOTO 1800
1720  PRINT "DISK FULL": GOTO 1800
1730  PRINT "FILE IS LOCKED": GOTO 1800
1740  PRINT "INVALID FILE NAME": GOTO 1800
1750  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1760  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1770  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1780  PRINT "ERROR #"; PEEK (222): PRINT  CHR$ (4);"FP"
1790  PRINT "INVALID FILE NAME": GOTO 1800
1800  INPUT "PRESS RETURN TO CONTINUE";A$
1810 TP =  PEEK (218) +  PEEK (219) * 256:TP = TP - 9000: IF TP < 0 THEN  CALL
     777: GOTO 1320
1820  CALL 777: GOTO 1430
```

LISTING 2

```
                X0      EQU $06         ;ADDRESSES OF ARRAY DATA
                Y0      EQU $0B
                X1      EQU $CE
                Y1      EQU $19
                X2      EQU $EB
                Y2      EQU $ED
                X3      EQU $F9
                Y3      EQU $FB
                ARRYLN  EQU $FD         ;NUMBER OF LINES
                PAGE    EQU $E6         ;PAGE INDICATOR
                PAGE1   EQU $C054       ;SOFT SWITCH TO PAGE ONE
                PAGE2   EQU $C055       ;SOFT SWITCH TO PAGE TWO
                HPOSN   EQU $F411       ;POSITIONS INTERNAL HI-RES CURSO
R
                HLINE   EQU $F53A       ;DRAWS LINE
                HCOLOR  EQU $F6F0       ;SETS COLOR
                BASE    EQU $26         ;ADDRESS OF SCREEN BYTE
                CHRGOT  EQU $B7         ;LOAD ACC WITH NEXT CHARACTER IN
 LINE
                COMBYT  EQU $E74C       ;EVALUATE FORMULA POINTED TO BY
TXTPTR AND CONVERT TO INTEGER
                GETNUM  EQU $E746       ;READ TWO BYTE INTEGER FROM TEXT
 POINTER
                LINNUM  EQU $50         ;FOR GETNUM
                GETARYPT EQU $F7D9
                ARRAYPT EQU $9B
                CHKCOM  EQU $DEBE
                BITPOS  EQU $30         ;ROUTINES AND LOCATIONS FOR EORL
INE
                INTX    EQU $F465
                INTY    EQU $F4D3
                COUNT   EQU $FF         ;FOR EORLINE
                        ORG $9200
9200  A9 00              LDA #0
9202  20 BE DE           JSR CHKCOM      ;GET ADDRESSES OF X0 THROUGH Y3
9205  20 D9 F7           JSR GETARYPT
9208  A5 9B              LDA ARRAYPT
920A  18                 CLC
920B  69 07              ADC #7
920D  85 06              STA X0
920F  A5 9C              LDA ARRAYPT+1
9211  69 00              ADC #0
9213  85 07              STA X0+1
9215  20 BE DE           JSR CHKCOM
9218  20 D9 F7           JSR GETARYPT
921B  A5 9B              LDA ARRAYPT
921D  18                 CLC
921E  69 07              ADC #7
9220  85 08              STA Y0
9222  A5 9C              LDA ARRAYPT+1
9224  69 00              ADC #0
9226  85 09              STA Y0+1
9228  20 BE DE           JSR CHKCOM
922B  20 D9 F7           JSR GETARYPT
922E  A5 9B              LDA ARRAYPT
9230  18                 CLC
9231  69 07              ADC #7
9233  85 CE              STA X1
9235  A5 9C              LDA ARRAYPT+1
9237  69 00              ADC #0
9239  85 CF              STA X1+1
923B  20 BE DE           JSR CHKCOM
923E  20 D9 F7           JSR GETARYPT
9241  A5 9B              LDA ARRAYPT
9243  18                 CLC
9244  69 07              ADC #7
9246  85 19              STA Y1
9248  A5 9C              LDA ARRAYPT+1
924A  69 00              ADC #0
924C  85 1A              STA Y1+1
924E  20 BE DE           JSR CHKCOM
9251  20 D9 F7           JSR GETARYPT
9254  A5 9B              LDA ARRAYPT
9256  18                 CLC
9257  69 07              ADC #7
9259  85 EB              STA X2
925B  A5 9C              LDA ARRAYPT+1
925D  69 00              ADC #0
925F  85 EC              STA X2+1
9261  20 BE DE           JSR CHKCOM
9264  20 D9 F7           JSR GETARYPT
9267  A5 9B              LDA ARRAYPT
9269  18                 CLC
926A  69 07              ADC #7
926C  85 ED              STA Y2
926E  A5 9C              LDA ARRAYPT+1
9270  69 00              ADC #0
9272  85 EE              STA Y2+1
9274  20 BE DE           JSR CHKCOM
9277  20 D9 F7           JSR GETARYPT
927A  A5 9B              LDA ARRAYPT
927C  18                 CLC
927D  69 07              ADC #7
927F  85 F9              STA X3
9281  A5 9C              LDA ARRAYPT+1
9283  69 00              ADC #0
9285  85 FA              STA X3+1
9287  20 BE DE           JSR CHKCOM
928A  20 D9 F7           JSR GETARYPT
928D  A5 9B              LDA ARRAYPT
928F  18                 CLC
9290  69 07              ADC #7
9292  85 FB              STA Y3
9294  A5 9C              LDA ARRAYPT+1
9296  69 00              ADC #0
9298  85 FC              STA Y3+1
929A  20 4C E7           JSR COMBYT      ;GET NUMBER OF ELEMENTS IN ARRAY
```

```
 107  929D  86 FD              STX ARRYLN
 108  929F  BE EC 95           STX I
 109  92A2  A2 03              LDX #3              ;DRAW ORIGINAL PICTURE
 110  92A4  20 F0 F6           JSR HCOLOR
 111  92A7  AD EC 95  PICLOOP  LDA I
 112  92AA  0A                 ASL
 113  92AB  AB                 TAY
 114  92AC  C8                 INY
 115  92AD  B1 06              LDA (X0),Y
 116  92AF  AA                 TAX                 ;LOW ORDER BITS OF X0
 117  92B0  B1 08              LDA (Y0),Y
 118  92B2  48                 PHA
 119  92B3  88                 DEY
 120  92B4  B1 06              LDA (X0),Y
 121  92B6  A8                 TAY                 ;HIGH ORDER BIT OF X0
 122  92B7  68                 PLA                 ;Y0
 123  92B8  20 11 F4           JSR HPOSN
 124  92BB  AD EC 95           LDA I
 125  92BE  0A                 ASL
 126  92BF  AB                 TAY
 127  92C0  B1 CE              LDA (X1),Y
 128  92C2  AA                 TAX                 ;HIGH ORDER BIT OF X1
 129  92C3  C8                 INY
 130  92C4  B1 CE              LDA (X1),Y
 131  92C6  48                 PHA
 132  92C7  B1 19              LDA (Y1),Y
 133  92C9  A8                 TAY                 ;Y1
 134  92CA  68                 PLA                 ;LOW ORDER BITS OF X1
 135  92CB  20 3A F5           JSR HLINE
 136  92CE  CE EC 95           DEC I
 137  92D1  10 D4              BPL PICLOOP
 138  92D3  A5 E6              LDA PAGE            ;SET UP DRAWING FOR HIDDEN PAGE
 139  92D5  49 60              EOR #$60            ;0110 0000
 140  92D7  85 E6              STA PAGE
 141  92D9  A9 01              LDA #1
 142  92DB  8D EB 95           STA SEGMENT
 143  92DE  A5 FD     TRNSLOOP LDA ARRYLN          ;MAIN LOOP
 144  92E0  8D EC 95           STA I
 145  92E3  A2 03              LDX #3
 146  92E5  20 F0 F6           JSR HCOLOR
 147  92E8  20 9E 93  ARRYLOOP JSR CALC            ;CALCULATE LINE BETWEEN ORIGINAL
 AND FINAL LINES
 148  92EB  AE F1 95           LDX XS              ;LOW ORDER BITS OF XS
 149  92EE  AC F2 95           LDY XS+1            ;HIGH ORDER BIT XS
 150  92F1  AD F3 95           LDA YS
 151  92F4  20 11 F4           JSR HPOSN           ;SET UP FOR DRAWING INTERMEDIATE
 LINE
 152  92F7  AD ED 95           LDA XT
 153  92FA  AE EE 95           LDX XT+1
 154  92FD  AC EF 95           LDY YT
 155  9300  20 3A F5           JSR HLINE           ;DRAW INTERMEDIATE LINE
 156  9303  CE EC 95           DEC I
 157  9306  10 E0              BPL ARRYLOOP        ;CONTINUE FOR THE REST OF THE LI
 NES IN THE ARRAY
 158  9308  A5 E6              LDA PAGE            ;SHOW INTERMEDIATE PICTURE
 159  930A  C9 40              CMP #$40            ;AND CHANGE PAGE TO NEW HIDDEN P
 AGE
 160  930C  D0 06              BNE SHOW1
 161  930E  2C 55 C0           BIT PAGE2
 162  9311  4C 17 93           JMP CHANGE
 163  9314  2C 54 C0  SHOW1    BIT PAGE1
 164  9317  A9 60     CHANGE   LDA #$60
 165  9319  45 E6              EOR PAGE
 166  931B  85 E6              STA PAGE
 167  931D  CE EB 95  ERASE    DEC SEGMENT         ;ERASE OLD INTERMEDIATE PICTURE
 NOW ON HIDDEN PAGE
 168  9320  A2 00              LDX #0
 169  9322  20 F0 F6           JSR HCOLOR
 170  9325  A5 FD              LDA ARRYLN
 171  9327  8D EC 95           STA I
 172  932A  20 9E 93  ERASLOOP JSR CALC            ;SAME PROCESS AS DRAWING PICTURE
 EXCEPT DRAWN IN BLACK
 173  932D  AE F1 95           LDX XS
 174  9330  AC F2 95           LDY XS+1
 175  9333  AD F3 95           LDA YS
 176  9336  20 11 F4           JSR HPOSN
 177  9339  AD ED 95           LDA XT
 178  933C  AE EE 95           LDX XT+1
 179  933F  AC EF 95           LDY YT
 180  9342  20 3A F5           JSR HLINE
 181  9345  CE EC 95           DEC I
 182  9348  10 E0              BPL ERASLOOP
 183  934A  EE EB 95           INC SEGMENT         ;SET UP SEGMENT FOR NEXT INTERME
 DIATE PICTURE
 184  934D  EE EB 95           INC SEGMENT
 185  9350  2C EB 95           BIT SEGMENT
 186  9353  50 B9              BVC TRNSLOOP        ;CONTINUE UNTIL SEGMENT EQUAL 64
 187  9355  A5 FD              LDA ARRYLN          ;DRAW FINAL PICTURE FROM X2,Y2,X
 3,Y3 ARRAYS
 188  9357  8D EC 95           STA I
 189  935A  A2 03              LDX #3
 190  935C  20 F0 F6           JSR HCOLOR
 191  935F  AD EC 95  LASTPIC  LDA I
 192  9362  0A                 ASL
 193  9363  AB                 TAY
 194  9364  C8                 INY
 195  9365  B1 EB              LDA (X2),Y
 196  9367  AA                 TAX                 ;LOW ORDER BITS OF X2
 197  9368  B1 ED              LDA (Y2),Y
 198  936A  48                 PHA
 199  936B  88                 DEY
 200  936C  B1 EB              LDA (X2),Y
 201  936E  A8                 TAY                 ;HIGH ORDER BIT OF X2
 202  936F  68                 PLA                 ;Y2
 203  9370  20 11 F4           JSR HPOSN
 204  9373  AD EC 95           LDA I
 205  9376  0A                 ASL
 206  9377  AB                 TAY
 207  9378  B1 F9              LDA (X3),Y
 208  937A  AA                 TAX                 ;HIGH ORDER BIT OF X3
 209  937B  C8                 INY
 210  937C  B1 F9              LDA (X3),Y
 211  937E  48                 PHA
 212  937F  B1 FB              LDA (Y3),Y
 213  9381  A8                 TAY                 ;Y3
 214  9382  68                 PLA                 ;LOW ORDER BITS OF X3
 215  9383  20 3A F5           JSR HLINE
 216  9386  CE EC 95           DEC I
 217  9389  10 D4              BPL LASTPIC
 218  938B  A5 E6              LDA PAGE            ;SHOW FINAL PICTURE
 219  938D  C9 40              CMP #$40            ;PAGE TWO
 220  938F  D0 06              BNE OTHERPAG
 221  9391  2C 55 C0           BIT PAGE2
 222  9394  4C 9A 93           JMP RETURN
 223  9397  2C 54 C0  OTHERPAG BIT PAGE1
 224  939A  20 B7 00  RETURN   JSR CHRGOT          ;RETURN TO CALLER
 225  939D  60                 RTS
 226                  ;CALC CALCULATES INTEMEDIATE LINES BETWEEN THE ORGINAL AN
 D FINAL LINES ACCORDING TO THESE FORMULAS:
 227                  ;INTERMEDIATE X0 = X0 + (X2-X0)*SEGMENT/64
 228                  ;INTERMEDIATE Y0 = Y0 + (Y2-Y0)*SEGMENT/64
 229                  ;INTERMEDIATE X1 = X1 + (X3-X1)*SEGMENT/64
 230
 231  939E  AD EC 95  ;INTERMEDIATE Y1 = Y1 + (Y3-Y1)*SEGMENT/64
 232  93A1  0A        CALC     LDA I
 233  93A2  A8                 ASL
 234                           TAY
 235                  ;MOVE THE ARRAY ELEMENTS INTO SIMPLE VARIABLES
 236                  ;XS=X0(I), YS=Y0(I), XT=X1(I), YT=Y1(I)
 YLENT=Y3(I)-Y1(I)    ;XLENS=X2(I)-X0(I), YLENS=Y2(I)-Y0(I), XLENT=X3(I)-X1(I),
 237  93A3  B1 06              LDA (X0),Y
 238  93A5  8D F2 95           STA XS+1
 239  93A8  B1 CE              LDA (X1),Y
 240  93AA  8D EE 95           STA XT+1
 241  93AD  B1 EB              LDA (X2),Y
 242  93AF  8D E4 95           STA XLENS+1
 243  93B2  B1 F9              LDA (X3),Y
 244  93B4  8D E8 95           STA XLENT+1
 245  93B7  B1 08              LDA (Y0),Y
 246  93B9  8D F4 95           STA YS+1
 247  93BC  B1 19              LDA (Y1),Y
 248  93BE  8D F0 95           STA YT+1
 249  93C1  B1 ED              LDA (Y2),Y
 250  93C3  8D E6 95           STA YLENS+1
 251  93C6  B1 FB              LDA (Y3),Y
 252  93C8  8D EA 95           STA YLENT+1
 253  93CB  C8                 INY
 254  93CC  B1 06              LDA (X0),Y
 255  93CE  8D F1 95           STA XS
 256  93D1  B1 CE              LDA (X1),Y
 257  93D3  8D ED 95           STA XT
 258  93D6  B1 EB              LDA (X2),Y
 259  93D8  8D E3 95           STA XLENS
 260  93DB  B1 F9              LDA (X3),Y
 261  93DD  8D E7 95           STA XLENT
 262  93E0  B1 08              LDA (Y0),Y
 263  93E2  8D F3 95           STA YS
 264  93E5  B1 19              LDA (Y1),Y
 265  93E7  8D EF 95           STA YT
 266  93EA  B1 ED              LDA (Y2),Y
 267  93EC  8D E5 95           STA YLENS
 268  93EF  B1 FB              LDA (Y3),Y
 269  93F1  8D E9 95           STA YLENT
 270  93F4  AD E3 95           LDA XLENS
 271  93F7  38                 SEC
 272  93F8  ED F1 95           SBC XS
 273  93FB  8D E3 95           STA XLENS
 274  93FE  AD E4 95           LDA XLENS+1
 275  9401  ED F2 95           SBC XS+1
 276  9404  8D E4 95           STA XLENS+1
 277  9407  AD E5 95           LDA YLENS
 278  940A  38                 SEC
 279  940B  ED F3 95           SBC YS
 280  940E  8D E5 95           STA YLENS
 281  9411  AD E6 95           LDA YLENS+1
 282  9414  ED F4 95           SBC YS+1
 283  9417  8D E6 95           STA YLENS+1
 284  941A  AD E7 95           LDA XLENT
 285  941D  38                 SEC
 286  941E  ED ED 95           SBC XT
 287  9421  8D E7 95           STA XLENT
 288  9424  AD E8 95           LDA XLENT+1
 289  9427  ED EE 95           SBC XT+1
 290  942A  8D E8 95           STA XLENT+1
 291  942D  AD E9 95           LDA YLENT
 292  9430  38                 SEC
 293  9431  ED EF 95           SBC YT
 294  9434  8D E9 95           STA YLENT
 295  9437  AD EA 95           LDA YLENT+1
 296  943A  ED F0 95           SBC YT+1
 297  943D  8D EA 95           STA YLENT+1
 298  9440  AD EB 95           LDA SEGMENT
 299  9443  0A                 ASL
 300  9444  0A                 ASL
 301  9445  8D F5 95           STA TEMP
 302  9448  A2 06              LDX #6
 303  944A  20 A2 94  LOOP     JSR DIV2
 304  944D  0E F5 95           ASL TEMP            ;ADD ON PORTION OF LINE LENGTH I
 F NEXT BIT IN TEMP IS 1
 305  9450  90 4C              BCC DONTADD
 306  9452  AD F1 95           LDA XS
 307  9455  18                 CLC
 308  9456  6D E3 95           ADC XLENS
 309  9459  8D F1 95           STA XS
 310  945C  AD F2 95           LDA XS+1
 311  945F  6D E4 95           ADC XLENS+1
 312  9462  8D F2 95           STA XS+1
 313  9465  AD ED 95           LDA XT
 314  9468  18                 CLC
 315  9469  6D E7 95           ADC XLENT
 316  946C  8D ED 95           STA XT
 317  946F  AD EE 95           LDA XT+1
 318  9472  6D E8 95           ADC XLENT+1
 319  9475  8D EE 95           STA XT+1
 320  9478  AD F3 95           LDA YS
 321  947B  18                 CLC
 322  947C  6D E5 95           ADC YLENS
 323  947F  8D F3 95           STA YS
 324  9482  AD F4 95           LDA YS+1
 325  9485  6D E6 95           ADC YLENS+1
 326  9488  8D F4 95           STA YS+1
 327  948B  AD EF 95           LDA YT
 328  948E  18                 CLC
 329  948F  6D E9 95           ADC YLENT
 330  9492  8D EF 95           STA YT
 331  9495  AD F0 95           LDA YT+1
 332  9498  6D EA 95           ADC YLENT+1
 333  949B  8D F0 95           STA YT+1
 334  949E  CA        DONTADD  DEX
 335  949F  D0 A9              BNE LOOP
 336  94A1  60                 RTS
 337  94A2  AD E4 95  DIV2     LDA XLENS+1         ;DIVIDE BY TWO AND ROUND TOWARDS
 ZERO
 338  94A5  C9 7F              CMP #127
 339  94A7  6E E4 95           ROR XLENS+1
 340  94AA  6E E3 95           ROR XLENS
 341  94AD  2C E4 95           BIT XLENS+1         ;IF XLENS IS NEGATIVE ADD ONE
 342  94B0  10 10              BPL NEXT1
 343  94B2  AD E3 95           LDA XLENS
 344  94B5  69 00              ADC #0
 345  94B7  8D E3 95           STA XLENS
 346  94BA  AD E4 95           LDA XLENS+1
 347  94BD  69 00              ADC #0
 348  94BF  8D E4 95           STA XLENS+1
 349  94C2  AD E8 95  NEXT1    LDA XLENT+1
 350  94C5  C9 7F              CMP #127
 351  94C7  6E E8 95           ROR XLENT+1
 352  94CA  6E E7 95           ROR XLENT
 353  94CD  2C E8 95           BIT XLENT+1
 354  94D0  10 10              BPL NEXT2
 355  94D2  AD E7 95           LDA XLENT
 356  94D5  69 00              ADC #0
 357  94D7  8D E7 95           STA XLENT
 358  94DA  AD E8 95           LDA XLENT+1
 359  94DD  69 00              ADC #0
```

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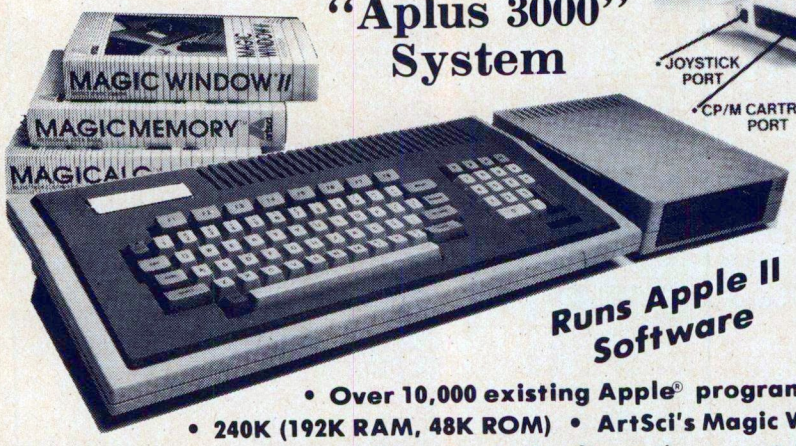

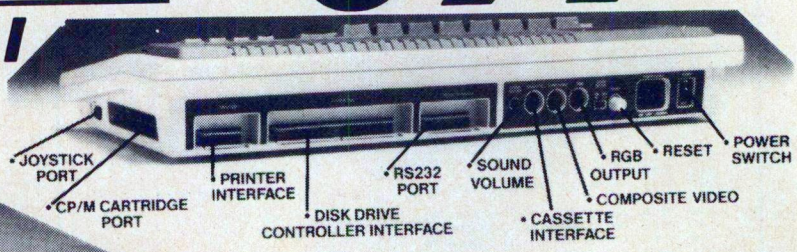

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- **Centronics printer interface included**
- **240K (192K RAM, 48K ROM)**
- **ArtSci's Magic Window II, Magic Memory, and MagiCalc included**
- **160K Laser 5¼" Disk Drive (Runs Apple II software)**
- **RGB (80 columns in color) and composite included**

SPECIFICATIONS

A plus 3000 is a complete, self-contained computer based on the popular 6502A microprocessor and can tap into the tremendous software library of Apple II. Features include 192K Bytes RAM, 32KB Enhanced Microsoft BASIC, 80 column text, 560H X 192V color graphic display, 81 key sculptured keyboard and high efficiency switching power supply. Also included as standard are Centronics bus printer interface, Cassette interface, 4 channel sound generator, and 5¼" Apple Compatible Disk Drive.

- **TEXT**
  - — 40 columns X 24 rows or 80 columns X 24 rows software selectable.
  - — 5 X 7 characters in 7 X 8 matrix.
  - — Upper and lower case characters.
  - — One of Eight colors for characters/graphics and background, Red, Green, Blue, Cyan, Magenta, Yellow, Black and White.
  - — Character set with normal, inverse and flashing capabilities.
- **GRAPHICS**
  - — 280H X 192V 6 colors — Black, White, Violet, Green, Blue, Orange.
  - — 280H X 192V 8 colors bit image — Black, White, Red, Green, Blue, Cyan, Magenta, Yellow.
  - — 560H X 192V 6 colors — Black, White, Violet, Green, Blue, Orange. (High resolution color monitor required)

More Features than Apple® for less than Commodore®

Features	Aplus 3000	Apple IIe	Commodore C-128
RAM	192K	64K	128K
Runs Apple II Software	Yes	Yes	No
Function Keys	24	None	16
4 Voice, 6 Octave Sound	Yes	No	Yes
Composite Video	Yes	Yes	Yes
Disk Drive	Included	Extra Cost	Extra Cost
Numeric Keypad	Included	Extra Cost	Included
Video Cable	Included	Extra Cost	Extra Cost
RGB Color Card	Included	Extra Cost	Included
80 Column Card	Included	Extra Cost	Included
Centronics Printer Interface	Included	Extra Cost	Extra Cost
Drive Controller	Included	Extra Cost	Included
$150 Wordprocessor (Magic Window)	Included	Extra Cost	Extra Cost
$150 Spreadsheet (MagiCalc)	Included	Extra Cost	Extra Cost
$60 Database prg. (Magic Memory)	Included	Extra Cost	Extra Cost
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RGB cable (RGB Monitor hookup)	$ 24.95	$ 19.95
Centronics cable (for Centronics printer)	$ 34.95	$ 24.95
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SPECIFICATIONS

(IBM — Commodore)

Size/Weight
Height 5.04" Width 16.7"
Depth 13.4" Weight 18.7 lbs.
Internal Char. Coding
ASCII Plus ISO
Print Buffer Size
120 CPS: 132 Bytes (1 line)
120/160 CPS Plus LQM: 2K
No. of Char. in Char. Set
96 ASCII Plus International
Graphics Capability
Standard 60, 72, 120 DPI
Horizontal 72 DPI Vertical
Pitch
10, 12, 16.7, 5, 6, 8.3, Proportional Spacing
Printing Method
Impact Dot Matrix

Char. Matrix Size
9H x 9V (Standard) to 10H x 9V
(Emphasized & Elongate)
Printing Features
Bi-directional, Short line seeking, Vertical Tabs, Horizontal Tabs
Forms Type
Fanfold, Cut Sheet, Roll (optional)
Max Paper Width
11"
Feeding Method
Friction Feed Std.; Tractor Feed Std.
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Cassette — Fabric inked ribbon
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4 million characters

(Apple — Atari — Etc.)

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Parallel 8 bit Centronics compatible
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Character Mode
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11 x 7 International Char.
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Character Spacing
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CIRCLE 18 READER SERVICE CARD

```
360  94DF  8D E8 95          STA XLENT+1
361  94E2  AD E6 95  NEXT2   LDA YLENS+1
362  94E5  C9 7F             CMP #127
363  94E7  6E E6 95          ROR YLENS+1
364  94EA  6E E5 95          ROR YLENS
365  94ED  2C E6 95          BIT YLENS+1
366  94F0  10 10             BPL NEXT3
367  94F2  AD E5 95          LDA YLENS
368  94F5  69 00             ADC #0
369  94F7  8D E5 95          STA YLENS
370  94FA  AD E6 95          LDA YLENS+1
371  94FD  69 00             ADC #0
372  94FF  8D E6 95          STA YLENS+1
373  9502  AD EA 95  NEXT3   LDA YLENT+1
374  9505  C9 7F             CMP #127
375  9507  6E EA 95          ROR YLENT+1
376  950A  6E E9 95          ROR YLENT
377  950D  2C EA 95          BIT YLENT+1
378  9510  10 10             BPL NEXT4
379  9512  AD E9 95          LDA YLENT
380  9515  69 00             ADC #0
381  9517  8D E9 95          STA YLENT
382  951A  AD EA 95          LDA YLENT+1
383  951D  69 00             ADC #0
384  951F  8D EA 95          STA YLENT+1
385  9522  60        NEXT4   RTS
386  9523  20 BE DE  EORLINE  JSR CHKCOM      ;SIMILAR TO LINE ALGORITHM IN RO
M
387  9526  20 46 E7          JSR GETNUM
388  9529  A5 50             LDA LINNUM
389  952B  85 06             STA X0
390  952D  A5 51             LDA LINNUM+1
391  952F  85 07             STA X0+1
392  9531  86 08             STX Y0
393  9533  20 BE DE          JSR CHKCOM
394  9536  20 46 E7          JSR GETNUM
395  9539  A5 50             LDA LINNUM
396  953B  85 CE             STA X1
397  953D  A5 51             LDA LINNUM+1
398  953F  85 CF             STA X1+1
399  9541  86 19             STX Y1
400  9543  A6 06             LDX X0
401  9545  A4 07             LDY X0+1
402  9547  A5 08             LDA Y0
403  9549  20 11 F4          JSR HPOSN
404  954C  A5 CE             LDA X1
405  954E  38                SEC
406  954F  E5 06             SBC X0
407  9551  48                PHA
408  9552  A5 CF             LDA X1+1
409  9554  E5 07             SBC X0+1
410  9556  8D F5 95          STA TEMP
411  9559  B0 0B             BCS ERRTERM
412  955B  68                PLA
413  955C  49 FF             EOR #$FF
414  955E  69 01             ADC #1
415  9560  48                PHA
416  9561  A9 00             LDA #0
417  9563  ED F5 95          SBC TEMP
418  9566  8D E4 95  ERRTERM STA XLENS+1
419  9569  8D ED 95          STA I+1         ;ERROR TERM
420  956C  68                PLA
421  956D  8D E3 95          STA XLENS
422  9570  8D EC 95          STA I
423  9573  A5 19             LDA Y1
424  9575  38                SEC
425  9576  E5 08             SBC Y0
426  9578  B0 04             BCS GETDY
427  957A  49 FF             EOR #$FF
428  957C  69 01             ADC #1
429  957E  8D E5 95  GETDY   STA YLENS
430  9581  6E F5 95          ROR TEMP
431  9584  AD E5 95          LDA YLENS
432  9587  18                CLC
433  9588  6D E3 95          ADC XLENS
434  958B  AA                TAX
435  958C  A9 00             LDA #0
436  958E  6D E4 95          ADC XLENS+1
437  9591  85 FF             STA COUNT
438  9593  AD EC 95  LOOP1   LDA I
439  9596  38                SEC
440  9597  ED E5 95          SBC YLENS
441  959A  8D EC 95          STA I
442  959D  AD ED 95          LDA I+1
443  95A0  E9 00             SBC #0
444  95A2  8D ED 95          STA I+1
445  95A5  B1 26     PLOT    LDA (BASE),Y
446  95A7  45 30             EOR BITPOS
447  95A9  91 26             STA (BASE),Y
448  95AB  CA                DEX
449  95AC  8A                TXA
450  95AD  49 FF             EOR #$FF
451  95AF  D0 06             BNE CHECKERR
452  95B1  C6 FF             DEC COUNT
453  95B3  A5 FF             LDA COUNT
454  95B5  30 2B             BMI RETRN1
455  95B7  90 0A     CHECKERR BCC MOVEY
456  95B9  AD F5 95          LDA TEMP
457  95BC  0A                ASL
458  95BD  20 65 F4          JSR INTX
459  95C0  4C 93 95          JMP LOOP1
460  95C3  AD F5 95  MOVEY   LDA TEMP
461  95C6  20 D3 F4          JSR INTY
462  95C9  AD EC 95          LDA I
463  95CC  18                CLC
464  95CD  6D E3 95          ADC XLENS
465  95D0  8D EC 95          STA I
466  95D3  AD ED 95          LDA I+1
467  95D6  6D E4 95          ADC XLENS+1
468  95D9  8D ED 95          STA I+1
469  95DC  4C A5 95          JMP PLOT
470  95DF  20 B7 00  RETRN1  JSR CHRGOT
471  95E2  60                RTS
472                  XLENS   DS 2            ;USED IN CALC ROUTINE
473                  YLENS   DS 2
474                  XLENT   DS 2
475                  YLENT   DS 2
476                  SEGMENT DS 1            ;HOW FAR TO TRANSFORM LINE
477                  I       DS 1            ;INDEX FOR X0,Y0,X1,Y1,X2,Y2,X3,
Y3
478                  XT      DS 2            ;TRANSFORMED LINE COORDINATES: X
S,YS,XT,YT
479                  YT      DS 2
480                  XS      DS 2
481                  YS      DS 2
482                  TEMP    DS 1

000  ERRORS

9200  HEX START OF OBJECT
95F5  HEX END OF OBJECT
03F6  HEX LENGTH OF OBJECT
9405  HEX END OF SYMBOLS
```

The QUICKSILVER program is designed to be user friendly. The arrow-key-driven menu means that the user does not have to remember complicated command sequences. In the LINES menu the user actually sees the line as created. This type of input is often referred to as rubber banding since the line stretches and shrinks like a rubber band. The immediate feedback that rubber banding provides makes line entering virtually painless for the user. The user also has the ability to immediately fix mistakes and edit all input easily. These features make QUICKSILVER fast and easy to use.

The QUICKSILVER program is fairly straightforward to understand. The purpose of the program is to fill the line lists and to call the machine code routine, SILVER. Before you delve into the inner working of QUICKSILVER, take a look at the variable list.

Lines 20 through 60 reload the QUICKSILVER program above hi-res page two and load SILVER above the program at address $9000. These lines also reset the Applesoft pointers so that all the variables for the program will be stored between $800 and $2000. Thus, both hi-res pages are protected from variables and program.

The following is a summary of the operational program sections.

Lines	Function
80-100	POKE in the shape for the hi-res cursor and small routine that clear up some ON ERR GOTO problems.
120-160	Sets up the main menu.
190-230	Get key presses from the user and print the brackets.
220-270	Process the right arrow key press.
280-300	Process the left arrow key press.
310-320	Process the return key and jumps to the appropriate code for each option.
340	The PIC1 option.
360	The PIC2 option.
380-1150	Handle the LINES menu.
380-390	Print the menu and draw the appropriate picture.
410-570	Handle key presses in much the same way as in the main menu. If ER is set then the current line is flashed between keyboard checks.
580-640	Handle cursor moves and rubber banding.
660-690	Handle the UP option.
710-720	Handle the PIN option.
740-820	Handle the ADD option.
840-980	Handle the ERASE option.
1000	The QUIT option and returns the user to the main menu.
1020-1060	Handle the DOWN option.
1080-1090	Handle the INCR option.
1110-1120	Handle the DECR option.
1140-1150	Handle the VIEW option.
1170-1210	Handle the CLEAR option.
1230-1300	Handle the SHIFT option.
1320-1410	Handle the LOAD option.
1430-1520	Handle the SAVE option.
1540-1550	Handle the QUIT option and ends the program.
1570-1610	Draw the pictures from the line lists.
1630-1820	Handle all errors.

The SILVER routine is called from within the SHIFT option. Here is a brief overview of the routine:

First, pointers are set up to point to the first elements of the arrays X0%,Y0%,X1%,Y1%,X2%,Y2%,X3%, and Y3%. Then the initial picture is drawn. Next an intermediate picture is calculated and drawn on the hidden page. The hidden page is then shown and the previous picture is erased. Then the next intermediate picture is calculated and drawn and the process continues until all the intermediate pictures are drawn and displayed. Lastly, the final picture is drawn and displayed and control is returned to the QUICKSILVER program.

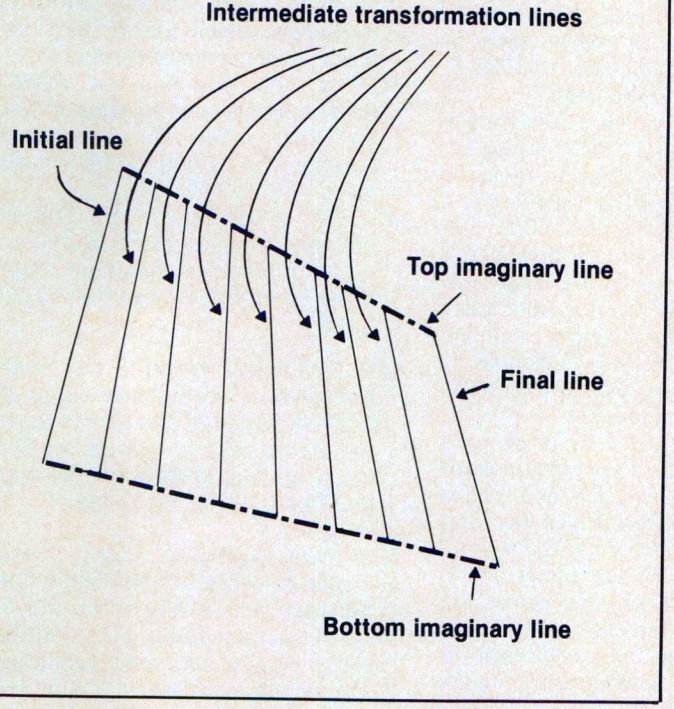
SILVER also contains a line drawing routine that draws lines that do not disturb the background. The algorithm is very similar to the algorithm in ROM, except that the points are exclusive OR'ed with screen before plotting.

The quicksilver effect is an interesting graphic effect that is fun to experiment with. Enjoy the program and see if you are able to come up with some amazing picture transformations.

Variable List

X0%,Y0%,X1%,Y1%	Array of coordinates for initial picture
X2%,Y2%,X3%,Y3%	Array of coordinates for final picture
PC	Flag indicating which picture is active
PT	Printer flag
L1	Length of line list for picture one
L2	Length of line list for picture two
SZ	Size of increment for hi-res cursor
V	View flag
CX,CY	Coordinates of brackets for the main menu
KY	ASCII code of key press
BX,BY	Coordinates of brackets for lines menu
JX,JY	Coordinates of hi-res cursor
HX,HY	Coordinates of pinning point
ER	Erase flag
PN	Pin flag

FIGURE 1



LISTING 3

```
10  HOME : VTAB 12: HTAB 8: PRINT "THE QUICKSILVER EFFECT"
20  PRINT  CHR$ (4);"BLOAD SILVER"
30  HIMEM: 37376
40  DIM X0%(26),Y0%(26),X1%(26),Y1%(26),X2%(26),Y2%(26),X3%(26),Y3%(26),X4
    %(26),Y4%(26),X5%(26),Y5%(26)
50  REM  CREATE AN ARRAY OF 26 DOTS CENTERED IN THE MIDDLE OF THE SCREEN
60  FOR I = 0 TO 26:X0%(I) = 139:Y0%(I) = 95:X1%(I) = 139:Y1%(I) = 95: NEXT
    I
70  REM  LOAD INITIAL PPICTURE
80  PRINT  CHR$ (4);"OPEN APPLE1": PRINT  CHR$ (4);"READ APPLE1"
90  INPUT L1: FOR I = 0 TO L1: INPUT X2%(I): INPUT Y2%(I): INPUT X3%(I): INPUT
    Y3%(I): NEXT I
100  PRINT  CHR$ (4);"CLOSE"
110  REM LOAD FINAL PICTURE
120  PRINT  CHR$ (4);"OPEN APPLE2": PRINT  CHR$ (4);"READ APPLE2"
130  INPUT L2: FOR I = 0 TO L2: INPUT X4%(I): INPUT Y4%(I): INPUT X5%(I): INPUT
    Y5%(I): NEXT I
140  PRINT  CHR$ (4);"CLOSE"
150  REM  PAD SHORTER LIST
160  FOR I = L1 + 1 TO L2:X2%(I) = X2%(I - L1 - 1):Y2%(I) = Y2%(I - L1 - 1
    ):X3%(I) = X3%(I - L1 - 1):Y3%(I) = Y3%(I - L1 - 1): NEXT I
170  HGR : HGR2
180  REM  TRANSFORM DOT TO APPLE1
190  REM  CALL 37376,FIRST LINE LIST, SECOND LINE LIST, LIST LENGTH
200  CALL 37376,X0%,Y0%,X1%,Y1%,X2%,Y2%,X3%,Y3%,26
210  FOR I = 1 TO 1000: NEXT I: REM WAIT AWHILE
220  POKE 230,32: CALL 62450: POKE 230,64: REM  CLEAR HIDDEN SCREEN
230  REM  TRANSFORM APPLE1 TO APPLE2
240  CALL 37376,X2%,Y2%,X3%,Y3%,X4%,Y4%,X5%,Y5%,26
250  POKE 230,32: CALL 62450: POKE 230,64: REM  CLEAR HIDDEN SCREEN
260  FOR I = 1 TO 1000: NEXT I: REM  WAIT
270  REM  TRANSFORM APPLE2 TO DOT
280  CALL 37376,X4%,Y4%,X5%,Y5%,X0%,Y0%,X0%,Y0%,26
290  FOR I = 1 TO 1000: NEXT I: REM  WAIT
300  TEXT : END
```

```
APPLE1:
(0):48  23  48  133
(1):48  133  88  148
(2):48  23  83  8
(3):83  8  83  43
(4):83  43  68  38
(5):88  148  88  108
(6):68  38  68  113
(7):68  113  88  108
(8):173  58  148  63
(9):148  63  143  78
(10):143  78  153  118
(11):153  118  168  123
(12):168  123  183  118
(13):183  118  193  123
(14):193  123  213  118
(15):213  118  218  78
(16):218  78  208  63
(17):208  63  188  63
(18):188  63  173  58
(19):188  58  203  53
(20):203  53  193  53
(21):193  53  188  58

APPLE2:
(0):73  13  53  13
(1):53  13  53  33
(2):53  33  73  33
(3):63  43  53  63
(4):63  43  73  63
(5):68  53  58  53
(6):53  93  53  73
(7):53  93  73  93
(8):53  103  53  123
(9):73  123  53  123
(10):168  33  178  13
(11):178  13  188  33
(12):183  23  173  23
(13):168  43  168  63
(14):168  43  183  43
(15):183  43  183  53
(16):183  53  168  53
(17):168  73  168  93
(18):168  73  183  73
(19):183  73  183  83
(20):183  83  168  83
(21):168  103  168  123
(22):168  123  188  123
(23):168  133  168  158
(24):168  158  188  158
(25):168  133  188  133
(26):168  146  183  146
```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Apple's New UniDisk

Cecil Fretwell

WHEN the new 3.5" 800K UniDisk was made available to the public, I was still satisfied to use my Enhanced //e with two floppy drives and wait until I could afford a hard disk such as the Profile. Having spent several hours of switching between an assembler, AppleWorks, and plain old ProDOS BASIC.SYSTEM, I got mad and spent the money for the UniDisk. After a couple of hours setting up my new toy, my productivity shot up at a fantastic rate.

Installing the UniDisk

I would like to pass on to you some ideas as to how to install and effectively use the UniDisk or a hard disk such as the Profile. DOS 3.3 users pay attention, because later I will show how to make the UniDisk work for you.

Installing the UniDisk takes about 20 minutes from the time you start opening the box. The manual recommends Slot 4 for the controller card; however, I recommend Slot 7 if it is available. Once you get a disk set up, the system will boot from the UniDisk if it resides in Slot 7. More on this later.

The system comes with a blank disk and a System Utilities for the UniDisk 3.5. The utility disk is ProDOS 1.1.1 based and supports both the 128K Apple //e and //c. Don't let this scare you old II+ users because a friend of mine has one and had no problems installing it. By the way, the utility disk looks like the disk which comes with the //c and should work on all systems to include the II+.

My dealer forgot to give me the utilities disk, which turned out to be a blessing in disguise. When I turned the system on after installing the UniDisk, it tried to boot from the UniDisk. When this failed, it switched to Drive 1 in Slot 6 and came up fine. There are situations where you might want to use this fact. For example, remove the disk from the UniDisk and a boot process will try to boot from a floppy.

While I am on the subject of booting, I had some instances in the set up process where I had BASIC.SYSTEM active and wanted to boot from a floppy. A simple PR#6 did the trick. Of course, there is always CALL -151 then enter 6 CTRL-P followed by the RETURN key.

Without the utility disk, I used FILER to format a blank 3.5" disk. Naturally, FILER told me I was about to format a large disk and proceeded accordingly. I gave my disk the volume name SYSTEM and grinned when I was told the UniDisk had 1600 blocks. A plain old floppy has only 280 blocks. If you do some basic math, you might be inclined to think one UniDisk is equivalent to 5.71 floppies. I will soon prove that 1600 divided by 280 is not necessarily equal to 5.71.

Based on experience in using hard disks at work, I already had some ideas as to how to set up a hard disk and carried this over to the UniDisk. If you don't use the subdirectory concept under ProDOS, you are limited to 51 file names and/or directory names. These file names are stored in the root directory of the disk. Using the root alone, one could reach the 51 limit in a hurry without using the full storage capacity of the disk. Once you start using a subdirectory, there is theoretically no limit to the number of file names and/or directory names within a subdirectory.

Creating Subdirectories

With this in mind, I first placed the files PRODOS, BASIC.SYSTEM, and a STARTUP program in the root directory of SYSTEM. I then used the ProDOS CREATE command to create several subdirectories. At the present time these are:

UTIL: Contains FILER, CONVERT, APA, some disk zapper programs, etc. In other words, general purpose utilities.

COMMANDS: I have some 24 commands I have developed to add to the BASIC.SYSTEM environment. These include a file copy command, format command, file compare command, disk compare command, etc.

MERLIN: This contains the MERLIN PRO assembler from Glen Bredon as distributed through Roger Wagner Publishing. More on this later.

MODEM: I belong to the DELPHI bulletin board system and use a communications package called MODEM MAGICIAN written by Gary Little.

APPLEWORKS: Need I say more. AppleWorks really flies using the UniDisk because one avoids having to insert a second disk to finally bring it up. Using AppleWorks alone justified the UniDisk fo me.

With these directories created, I copied only what I needed to from floppy disks. At this point, I have used a total of 676 of the 1600 blocks available on the UniDisk. This fact will soon have some significance.

For the reasoning behind this initial set up, the subdirectories are obviously organized in a logical, functional manner. In general, each directory represents a separate vendor. Therefore, if that vendor releases a new version, I will wipe out the contents of the current directory and replace it with the new release. This means I will never use, say, the MERLIN directory to also store any assembly sources I produce and test.

For any development work I perform, I will set up separate directories for this purpose. There is a method to this madness if you really think about it. Being an old hand at the computer game, I periodically make copies of my efforts. With my proposed

scheme, I will not have to back up the entire UniDisk which, in theory, would require 6 floppies (remember 1600/280 = 5.71). I will only make copies of files unique to my applications. Should I lose my SYSTEM disk, I recover the vendor related directories from the original distribution disks. I then recover my application files and I am back on the air.

Earlier I said that I had used 676 blocks, leaving me with a free space of 924 blocks. Assuming I were to use those entire 924 blocks for my own applications, I have reduced my backup disk requirements to 4 floppies. I am sure as time goes by, more and more of the UniDisk will be used for other vendor products and thus reduce the number of back up floppies required. I may even leave the UniDisk 'virgin' with vendor products and continue to use floppies for such things as AppleWorks files, MERLIN sources, etc.

Before I get into some details regarding some installation problems, let's return to my earlier statement to the effect that 1600 divided by 280 is not 5.71. Starting with my original ProDOS floppy with FILER, etc., I did not save much space using the UniDisk. The savings started when I began to create the various directories.

Every other directory came from a bootable floppy. Every floppy uses 7 blocks before you even place files on it. Two blocks contain the basic boot code, 4 blocks contain the root directory (limited to 51 entries), and one block contains the volume bit map. Already, I have saved 35 blocks (AppleWorks comes on two floppies). The PRODOS file requires 30 blocks. Coming from 4 bootable disks, I have saved 120 blocks. BASIC.SYSTEM requires 21 blocks. Two of the disks have BASIC.SYSTEM, I have saved 42 blocks. Every STARTUP file requires at least 1 block, I save 2 blocks. Adding this all up, I have saved 199 blocks. Now 1600 divided by 280 begins to approach 6.5, i.e., I can argue that the UniDisk represents 7 floppies, not 5.71. As I add more systems, the floppy equivalent factor begins to increase.

Getting to this point took about two hours. Getting the SYSTEM disk to an initial workable system took an additional two hours. For example, when I copied the MERLIN disk, I copied only those files I really use. I am not interested in the code for computing the Greek letter pi (3.141592654.....) nor am I interested in the clock code for the *//c* because I have a Prometheus clock card in my Enhanced *//e*. When I started testing the various systems, I found I missed a few files in the copy process and had to put them in the proper UniDisk directory.

Installing Merlin

The installation of MERLIN demonstrates a potential problem in getting SYS files to operate correctly using the smart run command (- command) if that SYS file resembles BASIC.SYSTEM or follows the rules set forth by Apple for a SYS file. The latest version of MERLIN contains a full screen editor which is installed by means of the STARTUP scheme. On the distribution floppy, the full screen editor is in a subdirectory called UTIL and has the name ED. Before I did some fixing, MERLIN would not come up with the editor active because it could not find ED.

The problem was easy to fix. First, I copied the ED file from the distribution floppy to the MERLIN directory. I then BLOADed MERLIN.SYSTEM into $2000. In any SYS file conforming to the standard rules, location $2006 contains the length of the STARTUP pathname. Starting at $2007, there is a 64 (decimal) byte area reserved for the STARTUP pathname. I changed this pathname to /SYSTEM/MERLIN/ED, adjusted the length in $2006 to 17 (decimal), then BSAVEd the file back to disk. I finally changed the name MERLIN.SYSTEM to just plain MERLIN because I am a lazy typist. The .SYSTEM is no longer required because I am now invoking MERLIN using the dash command instead of booting a disk.

All this time, I was having more fun than a barrel of monkies. I also became more and more impressed with the speed of the UniDisk compared to using floppies. As I said earlier, the increase in speed using AppleWorks is phenomenal.

Bootable UniDisk for DOS 3.3

Before I ramble on some more about jazzing up the system further, you DOS 3.3 people need a break. I still mess with DOS 3.3 once in a while and laid the groundwork to obtain a bootable UniDisk for DOS 3.3. Belonging to the DELPHI bulletin board system, I knew that a fellow sysop and friend Gary Little has made this possible. He sells a DOS 3.3 floppy disk called AMDOS 3.5 for the fantastic price of $15 (U.S.A.) or $20 (Canada). I obtained a copy by downloading it from DELPHI and within 5 minutes I had a bootable UniDisk for DOS 3.3.

The resulting UniDisk is divided into two logical 400K volumes. To select the two volumes on Drive 1, AMDOS uses the ,D1 and ,D3 parameters. If you have a second UniDisk, AMDOS uses ,D2 and ,D4 for the two volumes on Drive 2. Gary even gives you a patch to make FID work with the 3.5" disk.

If you are interested in AMDOS, get it from a friend and/or send $15 to:

Gary B. Little
#210 - 131 Water Street
Vancouver, B.C., Canada V6B 4M3
Tel: (604) 681-3371

Don't expect all DOS 3.3 programs to work using MDOS. Gary kills the INIT Code, therefore, an existing program which uses this same concept will not work on the UniDisk.

Modifying Apple's QUIT Code

Now back to the ProDOS world using my new SYSTEM disk. In my opinion, ProDOS has very few faults. One of them is the QUIT code logic. I quickly became tired of having to enter a prefix and pathname when I QUIT AppleWorks or MERLIN. I would rather have the QUIT logic return me to a state as if I had just booted from the UniDisk. Within a couple of hours, I had what I wanted and include in this article some code which seems to do the job.

When the QUIT logic is invoked, the ProDOS Machine Language Interface (MLI) code moves some code out of the Language Card area into $1000, then executes that code. The November 1985 issue of Apple Assembly Line from S-C software contains a commented listing of the Apple QUIT code. I modified this code as shown in the listing at the end of this article. If you modify the code even further, such code must be limited to three memory pages.

The code in $1000 through $1014 is almost an exact copy of the Apple QUIT code. It insures the system is in 40 column mode when the QUIT code finishes. At $100C I do a STA $C00E to force normal

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lower case letters and allow flashing upper case letters. The Apple code does a STA $C00F to activate the alternate character set. I think this is wrong because it may result in mouse text characters being activated, e.g., CONVERT has this same "bug." The end result of this block of code is to place the system in the old fashioned 40 column mode with the screen cleared.

The code in $1015 to $1029 is an exact copy of Apple's code. It cleans up the system bit map in the MLI global page and only protects what is absolutely necessary to maintain system integrity.

The code in $102A to $1031 sets the system prefix to SYSTEM which is the volume name of my 3.5" disk. If you choose a different volume name, a simple change is required starting at $1137. At $1137 first plant the length of the volume name to include the leading and trailing / characters. Follow this with the first /, the volume name, a second /, and a null. Remember to store the characters with the high bit (Bit 7) cleared. I have left enough room for a volume name of up to 15 characters. By doing this, the length of my code will always be 330 bytes.

If the MLI SET PREFIX call fails, the code in $1032 to $1051 first causes a message of the form

/SYSTEM/ NOT FOUND

to be displayed. The system then hangs in a death loop requiring the user to reboot the system.

If the proper volume name is found on the 3.5" disk, the code in $1052 to $10E0 attempts to load and execute BASIC.SYSTEM. If you prefer something other than BASIC.SYSTEM, change the length and pathname starting at $1126. I have left enough room to use a full 15 character system name. Note I use the term system because my code assumes the file loads and executes starting at $2000.

Briefly, the code in $1052 to $10E0 performs the following steps.

1. Checks to see if the specified system file exists.
2. Checks to see if the file is a SYS file.
3. Closes all currently open files, if any, from the previous application.
4. Checks to see if the file has read rights.
5. Checks to see if the file is longer than 64K.
6. Loads the SYS file.
7. Closes the SYS file.
8. Executes the system code starting at $2000.

If any step fails, a message of the form

LOAD BASIC.SYSTEM FAILED

is displayed. The system then hangs in a death loop requiring the user to reboot the system.

If you have an assembler and enter my source code, it will store the object code for you. If you choose to key the code in using something like the ROM monitor code, BSAVE it from $1000 with a length of 330, i.e., use something like

BSAVE QUIT.CODE,A$1000,L330

LISTING 1

```
                        2
                        3    * QUIT.CODE
                        4
                        5    ************************************
                        6    * SPECIAL QUIT CODE FOR UNIDISK 3.5 *
                        7    *                BY                  *
                        8    *           CECIL FRETWELL           *
                        9    ************************************
                       10
                       11    ************************************
                       12    * PREPARED USING MERLIN PRO ASSEMBLER *
                       13    ************************************
                       14
                       15    MLI       =     $BF00       ;CALL TO MLI
                       16    BITMAP    =     $BF58       ;SYSTEM BIT MAP
                       17    CLR80COL  =     $C000       ;DISABLE 80 COL STORE
                       18    CLR80VID  =     $C00C       ;DISABLE 80 COLUMN MODE
                       19    CLRALTCH  =     $C00E       ;NORMAL LC, FLASH UC
                       20    ROM       =     $C082       ;TURN ON MONITOR ROM
                       21    HOME      =     $FC58       ;CLEAR SCREEN
                       22    COUT      =     $FDED       ;DISPLAY CHARACTER
                       23    SETKBD    =     $FE89       ;DO A IN#0
                       24    SETVID    =     $FE93       ;DO A PR#0
                       25
                       26              ORG   $1000       ;CODE MOVED TO $1000
                       27
                       28    ************************************
                       29    * INITIALIZE SYSTEM TO 40 COLUMN MODE *
                       30    ************************************
                       31
1000: AD 82 C0         32              LDA   ROM         ;TURN ON MONITOR ROM
1003: 20 93 FE         33              JSR   SETVID      ;PR#0
1006: 20 89 FE         34              JSR   SETKBD      ;IN#0
1009: 8D 0C C0         35              STA   CLR80VID    ;DISABLE 80 COLUMN MODE
100C: 8D 0E C0         36              STA   CLRALTCH    ;NORMAL LC, FLASH UC
100F: 8D 00 C0         37              STA   CLR80COL    ;DISABLE 80 COL STORE
1012: 20 58 FC         38              JSR   HOME        ;CLEAR SCREEN
                       39
                       40    ****************************
                       41    * CLEAR OUT SYSTEM BIT MAP *
                       42    ****************************
                       43
1015: A2 17            44              LDX   #$17
1017: A9 01            45              LDA   #1          ;MARK $BFXX IN USE
1019: 9D 58 BF         46              STA   BITMAP,X
101C: CA               47              DEX               ;MOST PAGES ARE FREE
101D: A9 00            48              LDA   #0
101F: 9D 58 BF         49    CLRMAP    STA   BITMAP,X
1022: CA               50              DEX
1023: 10 FA            51              BPL   CLRMAP
1025: A9 CF            52              LDA   #$CF        ;$000-$1FF
1027: 8D 58 BF         53              STA   BITMAP      ;$400-$7FF IN USE
                       54
                       55    *****************
                       56    * SET UP PREFIX *
                       57    *****************
                       58
102A: 20 00 BF         59              JSR   MLI         ;SET THE PREFIX
102D: C6               60              HEX   C6
102E: E1 10            61              DA    VOLUME
1030: 90 20            62              BCC   BOOT        ;IF NO ERROR
1032: A2 00            63              LDX   #0          ;DISPLAY ERROR
1034: BD 38 11         64    :0        LDA   VOLNAME,X
1037: F0 08            65              BEQ   :1
1039: 09 80            66              ORA   #$80
103B: 20 ED FD         67              JSR   COUT
103E: E8               68              INX
103F: D0 F3            69              BNE   :0          ;ALWAYS BRANCH
1041: A2 00            70    :1        LDX   #0
1043: BD 1B 11         71    :2        LDA   NOVOLUME,X
1046: F0 08            72              BEQ   :3
1048: 09 80            73              ORA   #$80
104A: 20 ED FD         74              JSR   COUT
104D: E8               75              INX
104E: D0 F3            76              BNE   :2          ;ALWAYS BRANCH
1050: F0 FE            77    :3        BEQ   :3          ;GO INTO DEATH LOOP
                       78
                       79    ******************
                       80    * BOOT THE SYSTEM *
                       81    ******************
                       82
1052: 20 00 BF         83    BOOT      JSR   MLI         ;GET SYSTEM INFO
1055: C4               84              HEX   C4
```

To install the modified QUIT code in the PRODOS, use the following procedure:

```
UNLOCK /SYSTEM/PRODOS
BLOAD /SYSTEM/
PRODOS,TSYS,A$2000
BLOAD QUIT.CODE,A$5700
BSAVE /SYSTEM/
PRODOS,TSYS,A$2000,L14848
LOCK /SYSTEM/PRODOS
```

This procedure is for ProDOS 1.1.1. For earlier or later versions of ProDOS, you will have to find the location for the load module QUIT code, for 1.1.1 this is $5700 and the length of the PRODOS file from something like a CATALOG command.

The code seems to work under most conditions and essentially reboots the system without your having to do a lot of keying using the normal QUIT logic. I briefly tested it using FILER, CONVERT, MERLIN, and AppleWorks and encountered some minor problems. For example, FILER must have its own QUIT code because, if the current PREFIX is not the UniDisk and you QUIT, my scheme will not work since FILER uses the current PREFIX. CONVERT has this same problem.

Some closing thoughts about what my crystal ball sees in the future. When I returned to my dealer to pick up the Utilities disk I mentioned earlier, he showed me a new technical reference manual for the *//c* called "Apple *//c* Programmer's Guide to the 3.5 ROM." For $5 I obtained some very interesting material.

Installing the UniDisk on the *//c* requires a new ROM. This 32K ROM replaces the original 16K ROM and contains some really exciting things which I will now try to summarize.

The serial port has some new added commands which enable or disable the following features.

1. Automatic carriage return when the printer column count exceeds the printer line width.
2. Keyboard signals can be intermixed with characters coming over the serial port.
3. Automatic line feed after a carriage return is sent to the printer.
4. Automatic line feed removal from the incoming character stream.
5. XON/XOFF protocol can be enabled.

The Mini-assembler is included in the ROM. There are also STEP and TRACE routines to facilitate debugging machine language programs.

Perhaps the most exciting thing I see in the *//c* ROM is the Protocol Converter. You *//e* users should read on because through a friend, Gary Little, I found that the UniDisk attached to the *//e* will sup-

```
1056: E4 10      85              DA    SYSINFO
1058: 90 2F      86              BCC   GOTINFO     ;IF NO ERROR
105A: A2 00      87  DEATH      LDX   #0          ;DISPLAY ERROR
105C: BD 0D 11   88  :0         LDA   LOAD,X
105F: F0 08      89              BEQ   :1          ;IF DISPLAY DONE
1061: 09 80      90              ORA   #$80
1063: 20 ED FD   91              JSR   COUT
1066: E8         92              INX
1067: D0 F3      93              BNE   :0          ;ALWAYS BRANCH
1069: A2 00      94  :1         LDX   #0
106B: BD 27 11   95  :2         LDA   SYSNAME,X
106E: F0 08      96              BEQ   :3
1070: 09 80      97              ORA   #$80
1072: 20 ED FD   98              JSR   COUT
1075: E8         99              INX
1076: D0 F3      100             BNE   :2          ;ALWAYS BRANCH
1078: A2 00      101 :3          LDX   #0
107A: BD 13 11   102 :4         LDA   FAILED,X
107D: F0 08      103             BEQ   :5
107F: 09 80      104             ORA   #$80
1081: 20 ED FD   105             JSR   COUT
1084: E8         106             INX
1085: D0 F3      107             BNE   :4          ;ALWAYS BRANCH
1087: F0 FE      108 :5          BEQ   :5          ;DEATH LOOP
                 109
                 110 ***************
                 111 * FILE EXISTS *
                 112 ***************
                 113
1089: AD E8 10   114 GOTINFO     LDA   SYSTYPE
108C: C9 FF      115             CMP   #$FF        ;SYSTEM?
108E: D0 CA      116             BNE   DEATH       ;IF NOT, DIE
1090: 20 00 BF   117             JSR   MLI         ;CLOSE ALL FILES
1093: CC         118             HEX   CC
1094: F6 10      119             DA    CLOSE
1096: B0 C2      120             BCS   DEATH       ;IF FAILED
1098: AD E7 10   121             LDA   ACCESS
109B: 29 01      122             AND   #$1         ;OK TO READ FILE?
109D: F0 BB      123             BEQ   DEATH       ;IF NOT, DIE
109F: 20 00 BF   124             JSR   MLI         ;OPEN THE FILE
10A2: C8         125             HEX   C8
10A3: F8 10      126             DA    OPEN
10A5: B0 B3      127             BCS   DEATH       ;IF FAILED, DIE
10A7: AD FD 10   128             LDA   REFNUM      ;GET FILE REF NUMBER
10AA: 8D FF 10   129             STA   EOFREF      ;SET FOR GET EOF
10AD: 8D 04 11   130             STA   READREF     ;SET FOR READ
10B0: 20 00 BF   131             JSR   MLI         ;GET FILE LENGTH
10B3: D1         132             HEX   D1
10B4: FE 10      133             DA    EOF
10B6: B0 A2      134             BCS   DEATH       ;IF FAILED, DIE
10B8: AD 02 11   135             LDA   LENGTH+2
10BB: D0 9D      136             BNE   DEATH       ;IF TOO LONG, DIE
10BD: AD 00 11   137             LDA   LENGTH
10C0: 8D 07 11   138             STA   READCNT
10C3: AD 01 11   139             LDA   LENGTH+1
10C6: 8D 08 11   140             STA   READCNT+1
10C9: 20 00 BF   141             JSR   MLI         ;LOAD THE SYSTEM FILE
10CC: CA         142             HEX   CA
10CD: 03 11      143             DA    READ
10CF: 08         144             PHP               ;SAVE FLAGS
10D0: 20 00 BF   145             JSR   MLI         ;CLOSE THE SYSTEM FILE
10D3: CC         146             HEX   CC
10D4: F6 10      147             DA    CLOSE
10D6: B0 82      148             BCS   DEATH       ;IF FAILED, DIE
10D8: 28         149             PLP               ;RECOVER READ FLAGS
10D9: B0 03      150             BCS   DIE         ;IF READ FAILED, DIE
10DB: 4C 00 20   151             JMP   $2000       ;FIRE UP NEW SYSTEM
10DE: 4C 5A 10   152 DIE         JMP   DEATH
                 153 ***********************************
                 154 * MLI COMMAND LIST FOR SET PREFIX *
                 155 ***********************************
                 156
10E1: 01         157 VOLUME      HEX   01
10E2: 37 11      158             DA    VOLNAMEP
                 159
                 160 *****************************************
                 161 * MLI COMMAND LIST FOR GET SYSTEM FILE INFO *
                 162 *****************************************
                 163
10E4: 0A         164 SYSINFO     HEX   0A
10E5: 26 11      165             DA    BASICSYS
10E7: 00         166 ACCESS      HEX   00          ;ACCESS
10E8: 00         167 SYSTYPE     HEX   00          ;FILE TYPE
10E9: 00 00 00   169             DS    13          ;IGNORE REST OF INFO
10EC: 00 00 00 00 00 00 00 00
10F4: 00 00
                 170
                 171 ***************************************
                 172 * MLI COMMAND LIST TO CLOSE ALL FILES *
                 173 ***************************************
```

port much of what I say in the next few paragraphs.

The Protocol Converter

The Protocol Converter is a set of routines used to support I/O devices, such as the UniDisk 3.5, that connect to the external disk port on the *//c*. There is also reference to a Protocol Converter Bus (CBus) which consists of hardware and software components that permit and control communications between the Apple *//c* and intelligent I/O devices (such as UniDisk 3.5's) connected to the external disk port. Up to 127 intelligent I/O devices are supported by the software.

Protocol Converter calls are coded in a manner similar to calls to the ProDOS Machine Language Interface (MLI). I will demonstrate a call at the end of this article. There are seven calls which are briefly described below:

STATUS: Returns status information about the device. Examples would be read or write protection active.

READ BLOCK: Read a 512 byte block from the device.

WRITE BLOCK: Send a 512 byte block to the device.

FORMAT: Prepare all blocks on device for reading and writing.

CONTROL: Controls some device functions such as a warm reset.

INIT: Resets all devices.

OPEN: Prepares a character device for reading or writing.

CLOSE: Tells a character device that a sequence of reads or writes is over.

Some excellent listings full of comments regarding the code in the ROM are given in the reference manual. There is also some code provided for the AppleTalk *//c* Protocol Converter.

Now for an example of a call to the Protocol Converter on either the *//c* or the *//e*. Quoting the manual, "Protocol Converter calls are coded in a manner similar to ProDOS Machine Language Interface (MLI) calls: The program executes a JSR to a dispatch routine at address $Cs00 + ($CsFF) + 3, where ($CsFF) refers to the value of the byte located at $CsFF." The "s" in this quote stands for the slot number for the UniDisk.

A cute little function using the converter is coded in LISTING 2. Its execution causes the disk to be automatically ejected from the drive.

Remember that my UniDisk is in Slot 7. Also note that the unit number given is not in the form of a normal MLI unit number, it is a unit number under control of the Protocol Converter. Run this code and the UniDisk quietly ejects the disk from the drive.

All of this adds up to some exciting code in the future from Apple. Now we all begin to wonder what the rumored new machine from Apple will look like.

```
                        174
10F6: 01                175  CLOSE    HEX   01
10F7: 00                176           HEX   00
                        177
                        178  ***************************************
                        179  * MLI COMMAND LIST TO OPEN SYSTEM FILE *
                        180  ***************************************
                        181
10F8: C3                182  OPEN     HEX   03
10F9: 26 11             183           DA    BASICSYS
10FB: 00 18             184           DA    $1800
10FD: 00                185  REFNUM   HEX   00
                        186
                        187  ********************************************
                        188  * MLI COMMAND LIST TO GET EOF FOR SYSTEM FILE *
                        189  ********************************************
                        190
10FE: 02                191  EOF      HEX   02
10FF: 00                192  EOFREF   HEX   00
1100: 00 00 00          193  LENGTH   HEX   000000
                        194
                        195  ***************************************
                        196  * MLI COMMAND LIST TO READ SYSTEM FILE *
                        197  ***************************************
                        198
1103: 04                199  READ     HEX   04
1104: 00                200  READREF  HEX   00
1105: 00 20             201           DA    $2000
1107: 00 00 00          202  READCNT  HEX   000000
110A: 00 00 00          203           HEX   000000
                        204
                        205  ********************************************
                        206  * ERROR MESSAGE DISPLAYED IF SYSTEM NOT FOUND *
                        207  ********************************************
                        208
110D: 4C 4F 41          209  LOAD     ASC   'LOAD '
1110: 44 20
1112: 00                210           HEX   00
                        211
1113: 20 46 41          212  FAILED   ASC   ' FAILED'
1116: 49 4C 45 44
111A: 00                213           HEX   00
                        214
                        215  ********************************************
                        216  * ERROR MESSAGE DISPLAYED IF VOLUME NOT FOUND *
                        217  ********************************************
                        218
111B: 20 4E 4F          219  NOVOLUME ASC   ' NOT FOUND'
111E: 54 20 46 4F 55 4E 44
1125: 00                220           HEX   00
                        221
                        222  ***********************
                        223  * DEFAULT SYSTEM NAME *
                        224  ***********************
                        225
1126: 0C                226  BASICSYS HEX   0C
1127: 42 41 53          227  SYSNAME  ASC   'BASIC.SYSTEM'
112A: 49 43 2E 53 59 53 54 45
1132: 4D
1133: 00                228           HEX   00
1134: 00 00 00          229           HEX   000000
                        230  ***********************
                        231  * DEFAULT VOLUME NAME *
                        232  ***********************
                        233
1137: 08                234  VOLNAMEP HEX   08
1138: 2F 53 59          235  VOLNAME  ASC   '/SYSTEM/'
113B: 53 54 45 4D 2F
1140: 00 00 00          236           HEX   000000
1143: 00 00 00          237           HEX   000000
1146: 00 00 00          238           HEX   000000
1149: 00                239           HEX   00

--End assembly, 330 bytes, Errors: 0
```

LISTING 2

```
0300: 20 0D C7 EJECT    JSR $C70D      ;CALL THE CONVERTER
0303: 04                HEX 04         ;CMD NO FOR CONTROL
0304: 08 03             DA  CMDLIST    ;COMMAND LIST
0306: 18                CLC            ;RETURN TO SYSTEM
0307: 60                RTS
0308: 03        CMDLIST HEX 03         ;THREE PARAMETERS
0309: 01                HEX 01         ;UNIT NO. = 1
030A: 0D 03             DA  CONTROL    ;CONTROL LIST
030C: 04                HEX 04         ;EJECT DISK
030D: 00        CONTROL HEX 00         ;NO CONTROL LIST
```

Issues in Using Spreadsheets—Not For Beginners Only: Part 1

Jeffrey M. Jacques

OVER the past few years, the articles appearing in "THE Spreadsheet Sheet" have increasingly dealt with complex and creative uses of THE Spreadsheet. We sometimes forget that every year there are thousands of new users. At the same time, thousands of other users begin to move from simple one-shot worksheets to the development of sophisticated templates. The next few articles are designed to examine several basic issues that new and seasoned users may have about working with spreadsheets. While we are examining these issues, we will take the opportunity to illustrate many of our major points with some interesting applications (e.g., checkbook, budget and net worth templates). So, take a few minutes and examine the rest of this article even if you are a seasoned spreadsheet user.

When most of us buy a new software package we are often impelled to closely examine it by booting it up and trying most of the various options. Let's face it. We spent a tidy sum on an Apple and on the software. Why shouldn't we load and go? Since spreadsheet software like THE Spreadsheet come with a tutorial, loading the program and following the tutorial is often an appropriate first step. Indeed, for those of you who have not tried the tutorial that came with your VisiCalc, SuperCalc, MagiCalc or THE Spreadsheet, I recommend that you try it. It will help you to master basic cursor movements and simple data/label entries and how to enter basic functions.

With THE Spreadsheet, you can easily, efficiently, and effectively, (1) develop budgets and make financial decisions for the home or office, (2) keep inventories and determine when and how much to purchase, (3) keep financial accounts, determine loans and payment rates, track stocks and bonds, develop commission payments, examine alternate depreciation strategies, (4) keep and determine student grades, (5) perform statistical analysis, and much, much more. The point is, if you have the basic skills in using THE Spreadsheet, and can think about what you wish to do and how you wish to do it, then your spreadsheet software becomes a logical tool to handle those questions which can best be solved by simple mathematics.

Step One: Define the Problem—A Good Place to Start

The best place to begin the construction of any worksheet or template is with yourself. Only you know what your needs are, what you wish to say, and how you wish to say it.

You probably purchased THE Spreadsheet under one of three conditions: (1) you heard an enormous amount of information about electronic spreadsheets and wished to see what they can do, (2) it was part of an integrated package, and/or (3) you had a specific need to solve a thorny and recurring problem. If you know what you wish to do with spreadsheet software, that's great. Simply skim the next few paragraphs and consider the questions at the end of this month's article.

But, if you are one of those people who purchased an integrated package which included a spreadsheet program, or if you bought spreadsheet software to "see what it could do," then take a few minutes and think about decisions you will need to make in the near future. Now, it's unlikely that any spreadsheet software can determine whether or not you should get married, have a child, get a divorce, or sell the family farm. But if you can examine the basic problem or some aspect of the problem with basic mathematics—e.g., When can I afford to get married? How much will a child cost? How are we going to divide our property? What would be my net gain (loss) if I sold the farm?—then spreadsheet software can be a powerful tool. The point is this: all of us are facing difficult problems and looking for reasonable solutions. Your first step, then, is to rephrase questions in such a way that simple mathe-

matics can handle at least some aspect of the problem.

Step Two: Components of the Problem

The next step in solving any problem is to spend some time identifying its component parts. All problems seem to have many subcategories. Try to identify as many as you can. If you are a new user, then a small subsection of a larger problem is a good way to start. Indeed, by starting with a small problem where you can identify most of the variables and data, you will be better able to embellish your spreadsheet at a later time. Small models have a way of growing into substantial templates. So, isolate the problem and think about the components, and the interrelationship among the components, of the problem.

Step Three: Writing

Writing out your idea will help you to crystallize your thoughts about the problem. While some like to run to their Apple and begin using their software, I suggest that you spend some time simply outlining what you are trying to accomplish, what facts are essential, what subconcepts are important, what data and formulae are needed, etc.

Step Four: Basic Mathematics

Now, check to make sure that your idea can be expressed with basic mathematic statements. If you are adding, subtracting, multiplying or dividing, or if you wish to compare any two or more values, then basic mathematics can help. You have chosen an appropriate problem for spreadsheet analysis as long as you can express your problem in mathematical terms.

Where We Are Going

Now that you have a problem, we shall explore fundamental questions about how to: (1) work through your problem and develop your worksheet or template, (2) organize your worksheet or template, and (3) actually build your worksheet or template. (There is that word again, template.)

Perhaps I should begin by defining what I mean by a *worksheet* and what I mean by a *template*. For me, both a worksheet and a template are a set of well defined spreadsheet instructions which help to solve problems. They include the essential labels, formulae and functions so that the spreadsheet program may do our bidding and produce accurate results.

The major differences between a worksheet and a template include purpose, time dimension, and who shall use it. The purpose of a worksheet is generally to create an easily modifiable spreadsheet application for your own limited use. Templates, on the other hand, are not easily modified. Rather, they are generally built to handle a variety of options and require little or no modification. Additionally, templates are designed to handle options so that they may be used over an extended period of time. Finally, templates may be used by you or by others in multiple situations. So, if you plan to use the same model for a wide variety of situations or over an extended period of time, or if you plan for others to use your spreadsheet application, then you are probably interested in constructing a good template.

Let's use the construction of a checkbook application as an example. If you were interested in just keeping track of your checks and reconciling your checkbook at the end of the month, then a worksheet like the one in Table 1 might be sufficient. After all, it has all the essential data: column B identifies the check number; column C indicates the date. The payee and purpose of the check are noted in columns D and E, respectively. (We have expanded the width of these columns so that you may more easily display the payee names and the purposes of the check.) The amount of the check is recorded in column F. Column G is used to record deposits. Finally, column H computes a running balance which is based on the immediate previous balance, the amount of the check, if any, and the amount of the deposit. Balancing your checkbook is easy when you use this worksheet. Cell H11 simply takes the previous balance (cell H10), adds the amount deposited (cell G11) and subtracts the amount of the check (cell F11). For successive balances — rows 12 through 30 — the worksheet simply uses each row, looks to see if it can add to the previous balance any deposits

TABLE 1. CHECKBOOK WORKSHEET

	A	B	C	D	E	F	G	H
1	Jacques				CHECK	BOOK	WORK SHEET	
2	1/1/86							
3		=========	=========	==================	==========	=========	=========	=========
4								
5		Check	Date	Pay To	For	Amo unt		Check
6		Number				---------	---------	Book
7						Check Amount	Deposit	Balance
8								
9		---------	---------	------------------	----------	---------	---------	---------
10			1 Jan. 1	Acme Builders	Mortgage	400.00	800.00	400.00
11			2	Centel	Telephone	35.21		364.79
12			3 Jan. 3	Sears	Baseball glov	21.93		342.86
13			4	Publix	Food	100.00		242.86
14			4	Metropolitan	Auto insuranc	99.00		143.86
15			5 Jan.13	Dr. Campbell	Dentist	65.00		78.86
16			6 Jan.15	City of Tallahassee	Utilities	232.65	800.00	646.21
17			7	Leon County Tax	Real Estate	980.87	1000.00	665.34
18			8	Publix	Food	100.00		565.34
19			9	Church	Dues	30.00		535.34
20			10 Jan.30	Dr. Max	Physician	35.00		500.34
21			11	Pharmacy	Drugs	18.50		481.84
22								481.84
23								481.84
24								481.84
25								481.84
26								481.84
27								481.84
28								481.84
29								481.84
30								481.84
31		Bank	Charges & Payments					
32		---------	---------	------------------	----------	---------	---------	---------
33								
34		TOTALS				2118.16	2000.00	481.84
35		=========	=========	==================	==========	=========	=========	=========
36								
37								
38								
39								
40								
41								
42								
43								

(e.g., cell G12) and then subtracts the amount of the check (e.g., cell F12). Finally, the simple @SUM function is used to compute most of the totals in row 34. This might be all you need and you might be satisfied with this approach.

But look at Table 2. It is a checkbook template which not only includes the same information as that in the worksheet, but it performs a number of important operations which will be useful when you try to compare your household budget with expenses or you go to complete your tax returns. Note the additional information included in this template—monthly and year to date totals, budget expense categories, etc. Note also how the layout facilitates your or your spouse's use.

Now, see if you noted all the differences between this template and the worksheet of Table 1. This checkbook template is divided into five sections. The first section, and the first difference, is your year to date transactions. It is in row 2. Since we are starting with a new year, all these values, except for a balance of $600.00, are zero. But, as we move from one month to the next, this row can be used to keep a running total of all checks cashed and other important information.

Part 2, columns B through H is your standard checkbook ledger. It is essentially the same as that of Table 1. It does include enough room for you to write twenty checks each month. Additionally, we have left room, see row 31, to indicate bank payments and charges during the month. This should help you reconcile your checkbook account.

Towards the bottom of the template you will find part 3. We will use this area to keep track of two totals. First, we shall note End of Month Totals (see row 33). These are tabulated with the simple @SUM function for each appropriate column. (The major exception is cell H33 which is computed by the formula +G33-F33, e.g., the sum of the total amount deposited minus the sum total of the amount of checks written.) Then, in row 34, a "New Year To Date Total" is recorded for each column. This is accomplished by adding row 2 to row 33 for each column.

Parts 4 and 5 are the most extensive differences between the checkbook worksheet and the checkbook template. In part 4, columns I and J, you will be able to indicate some additional information about each check. In column I you will be able to note if the check was written for a taxable item. In column J you will be able to enter the budget code category. These two data values will enable you to automatically: (1) calculate monthly gross expenses (thus enabling additional work with your budget), and (2) keep track of checks written which have implications for filing your itemized income tax return. That is, columns K through M keep track of sales, state and real estate taxes, columns O through Q list medical expenses, and tax deductible contributions are listed in columns S and T. All of these results may be used to affect our taxes liability. Finally, monthly expenses are noted in columns V though AB. Mortgage information is listed in column V, utilities, food

TABLE 2. CHECKBOOK TEMPLATE

	A	B	C	D	E	F	G	H	I	J
1	Jacques				CHECK	BOOK		TEMPLATE		
2	1/1/86	Year to	Date Sum mary:			0.00	0.00	600.00		
3										
4										
5		Check	Date	Pay To	For	Amo unt		Check	Is Check	Budget
6		Number				Check Amount	Deposit	Book Balance	Taxable (1=YES)	Code
7										
8										
9										
10			1 Jan. 1	Acme Builders	Mortgage	400.00	200.00	400.00	0	8
11			2	Centel	Telephone	35.21		364.79	1	11
12			3 Jan. 3	Sears	Baseball glov	21.93		342.86	1	14
13			4	Publix	Food	100.00		242.86	1	10
14			4	Metropolitan	Auto insuranc	99.00		143.86	1	13
15			5 Jan.13	Dr. Campbell	Dentist	65.00		78.86	0	4
16			6 Jan.15	City of Tallahassee	Utilities	232.65	800.00	646.21	1	9
17			7	Leon County Tax	Real Estate	980.87	1000.00	665.34	0	2
18			8	Publix	Food	100.00		565.34	1	10
19			9	Church	Dues	30.00		535.34	1	6
20			10 Jan.30	Dr. Max	Physician	35.00		500.34	0	4
21			11	Pharmacy	Drugs	18.50		481.84	0	3
22								481.84		
23								481.84		
24								481.84		
25								481.84		
26								481.84		
27								481.84		
28								481.84		
29								481.84		
30								481.84		
31		Bank	Charges & Payments					481.84		
32										
33		End of	Month	Totals:		2118.16	2000.00	481.84		
34		New Year	Date	Totals:		2118.16	2000.00	481.84		
35										
36										
37		Budget#	Category	Budget#	Category	Budget#	Category			
38										
39			1 State Tax		6 Church		11 Telephone			
40			2 Real Est.		7 Contrib.		12 Credit/Lo			
41			3 Drugs		8 Rent/Mortga		13 Insurance			
42			4 Doctors		9 Utilities		14 Other Exp			
43			5 Transport		10 Food					

TABLE 1.2. APPENDED CHECKBOOK COLUMNS

	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1										CHECK		BOOK			SUPPLEMEN TAL	CALCULATI ONS		
2	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
3																		
4		Taxes				Medical			Contribut ions									
5															Monthly	Expenses		
6	.05	State	Real Est.		Drugs	Medical			Church	Other		Rent Mortgage	Utilities	Food	Telephone	Credit Loans	Insur.	Other
7																		
8	Sales	1	2		3	4	5		6	7		8	9	10	11	12	13	14
9																		
10												400.00						
11	1.68														35.21			
12	1.04																	
13	4.76																	21.93
14	4.71													100.00				
15						65.00											99.00	
16	11.08																	
17			980.87										232.65					
18	4.76																	
19	1.43													100.00				
20									30.00									
21					18.50	35.00												
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		
31																		
32																		
33	29.46	0.00	980.87		18.50	100.00	0.00		30.00	0.00		400.00	232.65	200.00	35.21	0.00	99.00	21.93
34	29.46	0.00	980.87		18.50	100.00	0.00		30.00	0.00		400.00	232.65	200.00	35.21	0.00	99.00	21.93
35																		

NOTE: Columns N and U are only one column wide and have been inserted for ease in reading table outputs.

telephone, etc. are listed in columns X through AB.

There are several methods for getting the data to the appropriate budget category. First, you can copy from the "Check Amount" column (column F) to any of these tax/budget columns. For example, we know that the monthly mortgage check amount was registered in cell F10. To register this amount in cell V10, place the marker in cell V10, enter + F10. Now, you can enter a RETURN and the value of 400 will be referenced into cell V10.

The second method involves the same steps as those outlined above. Place the marker in the appropriate cell, enter the cell reference, and then press !. This will transform your cell reference into the actual numeric value. A simple press of the RETURN key will enter this value. Either of these two methods will work fine if you don't mind moving the marker or don't have much RAM.

But here is the method that I recommend. You can use column J as a budget code column. A "1" indicates state and local taxes, a "2" indicates real estate taxes, etc. A simple @IF expression in each budget cell category will do all the work (e.g., in cell L10, enter the expression:

@IF(J10 = L8,F10,0)

and, in cell M10,

@IF(J10 = M8,F10,0)

Thus, if the budget code value is entered in column J, the dollar value in column F is automatically transferred to the appropriate budget column. Alternately, a value of zero will appear if you are using THE Spreadsheet.

You might be wondering why I chose to use cell references rather than values of 1, 2, 3, etc. It is simply easier to /Replicate a range of cells, requesting the software to highlight which cell references we wish to have as Relative and which as No Change (or Adjust/No Adjust) than it is to re-key each expression for each new column.

Now, for computing the value of sales tax. In Florida, the sales tax is 5%. A value of .05 is listed in cell K6. (You may need to change this to whatever sales tax you must pay.) The following is used to compute the amount of sales tax on any check:

check amount - check amount / (1 + sales tax)

So, for cell K11, the following formula is used:

F11 - (F11 / (1 + K6))

This will work for most cells. However, not all payments are taxable—at least in Florida. So, you can simply check the value stored in column I, and modify the expression to include:

@IF(I11 = 1,(F11—(F11 / (1 + K6))),0)

or

@IF(I11 = 1,@ROUND(F11—(F11 / (1 + K6)),2),0)

So, if it is a taxable item, compute the amount of the sales tax, otherwise enter a value of 0. Not too tough.

Finally, a note on formatting the output and the screen display. If you are using SuperCalc3a, then you can set the user defined format option to display a blank where a value of zero would appear. This is eminently more readable since 0.00 values are suppressed.

Here's another format tip. By carefully using the /Windows command, all the budget categories and their values (rows 37 to 43) can be displayed even though it is not in an adjacent area of the worksheet. This is a real help if you, or someone else, is coding the check budget categories. Table 3 is what you should see when you finish entering the /Window and /Title commands, and format the display of the output. More about these commands in the next issue. For now, save the master template—before you enter any data—so that you will be able to load it each month. Now, try entering your data.

TABLE 3. DISPLAY SCREEN OF CHECKBOOK TEMPLATE

	B	C	D	E	F	G	H
5	Check	Date	Pay To	For	Amo unt		Check
6	Number						Book
7					Check Amount	Deposit	Balance
8							
9	---	---	---	---	---	---	---
10							0.00
11							0.00
12							0.00
13							0.00
14							0.00
15							0.00
16							0.00

	B	C	D	E	F	G	H
37	Budget#	Category	Budget#	Category	Budget#	Category	
38	---	---	---	---	---	---	
39	1	State Tax	6	Church	11	Telephone	
40	2	Real Est.	7	Contrib.	12	Credit/Lo	
41	3	Drugs	8	Rent/Mortga	13	Insurance	
42	4	Doctors	9	Utilities	14	Other Exp	
43	5	Transport	10	Food			

Sharing Data Among Worksheets

By now you must be wondering how we move the summary "Year To Date Totals" from one month to the next. There's more than one way to accomplish this. First, if you are using only parts 1, 2, and 3 of this template, you can simply enter the values on a new worksheet. After all, you have probably made a hard copy of the work from last month. So, entering three values on row 2, columns F, G and H, will not be to arduous.

If you are using more than these few columns, then you might wish to read on. One choice is to save the current month data, then /Replicate the VALUES from row 34 to row 2. Now, if you /Blank out all the cells with data from last month, then you are ready to use the worksheet for this month. This is pretty easy, too.

A final choice would be to use the DIF files. Here's how. Place your marker in cell F34. Enter **/S**torage. The prompt line will display "ENTER LOWER RIGHT OR RETURN." Either enter AB34 or move the marker to cell AB34. Then press RETURN.

At this point you should see your typical FILE SUBSYSTEM menu. The starting cell should indicate F34 and the ending cell should indicate AB34. Since we will be using the DIF format, enter C . The line USE DIF FORMAT will be highlighted. A simple press of RETURN will change the displayed NO to YES. Enter D, ROW ORDER FOR DIF will be highlighted, and press RETURN. YES will now be displayed on row D and indicate that we wish to save data in row, rather than columnar, format.

Now's your chance to save just row 34. Enter 3 and press RETURN. THE Spreadsheet will ask what file name you wish to save this data under. Enter CHECK.DIF, or any other name which you find easy to use. The disk drive will

begin to whir and clank and then your data will be saved. Once the FILE SUBSYSTEM menu is displayed, reset the DIF format lines (C and D) back to NO.

Now, assuming that you have already saved your completed worksheet, perform **/CY**. This will clear your worksheet so that you may start a new template and enter your data for the next month. Simply go back to the FILE SUBSYSTEM and enter **4**, LOAD WORKSHEET. Load your checkbook template from your diskette, and go to the CALCULATE SUBSYSTEM. Place the marker in cell F2, enter **/S**torage and then RETURN. After making sure that lines C and D say YES, enter **4**, LOAD WORKSHEET. THE Spreadsheet will ask you to identify the file you wish to load. If you used the file name convention suggested above, then enter CHECK.DIF., or its identifying number. Press RETURN and THE Spreadsheet will give you a warning about overlays and destruction. Press RETURN again and THE Spreadsheet will load the data from last month "New Year to Date Totals" to "Year to Date Summary." Everything will be in its appropriate column.

(Before you run to check that I am telling you the truth, while still in the FILE SUBSYSTEM, change your DIF lines back to NO. It's too easy to forget, so do it now. Now, go to the CALCULATE SUBSYSTEM and check the values listed in row 2. They will be the same as those listed in row 34 of the last worksheet.)

Summary

Templates, then, are spreadsheet models which will: (1) guide you or any other user in how to enter data and what data should be entered, (2) automatically transport information to appropriate columns, (3) perform essential calculations, and (4) provide a result or table(s) of results which may be shared with other persons. One way of thinking about templates is to think about what you need to know, what you wish to do (compute) with it, and how you wish to display the entries, calculations, and results.

Here are a series of reasonable questions that you may wish to consider before creating any spreadsheet worksheet or template:

QUESTION #1: Do I understand the problem?
QUESTION #2: Template or worksheet?
QUESTION #3: How can I best structure the template?
QUESTION #4: How can I best communicate my results?
QUESTION #5: What data are needed?
QUESTION #6: What is/are the essential formulae?
QUESTION #7: How redundant do I need to be?
QUESTION #8: What have I forgotten?
QUESTION #9: What's the easiest way to build the template?
QUESTION #10: How best to test this version of the template?
QUESTION #11: What cells need to be protected?
QUESTION #12: Do I need instructions in this template?
QUESTION #13: Final warnings — recalculations?
QUESTION #14: Do I need other documentation?
QUESTION #15: How best to test the final template?

By the way, here are some references that I have found useful over the past few years. They were helpful in formulating these questions and in providing information about some possible solutions to application problems.

Castlewitz, David M., Lawrence J. Chisausky and Patricia Kronberg. *VisiCalc:Home and Office Companion.* Berkeley, CA: Osborne/McGraw-Hill, 1982.

Cobb, Douglas Ford and Gena Berg Cobb. *VisiCalc Models for Business.* Indianapolis, IN: Que Corporation. 1983.

Flast, Robert H. *54 VisiCalc Models.* Berkeley, CA: Osborne/McGraw-Hill, 1983.

Hergert, Douglas. *Mastering VisiCalc.* Berkeley, CA: SYBEX Inc., 1983.

Williams, Robert E., J. Taylor Bruce and Brian L. King. *The Power of VisiCalc.* Portland, OR: Management Information Source, Inc., 1982.

When you find some time, a trip to the library and an examination of these and other related books can be helpful in answering the questions listed above. In the next part of this series we shall explore these questions more thoroughly.

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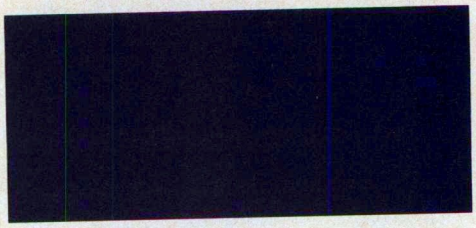
CIRCLE 22 READER SERVICE CARD

Review of "Apple Pascal 1.3"

Product: Apple Pascal 1.3
Use: Programming language for Apple II family, minimum 64K.
Company: Apple Computer, Inc. Cupertino, CA
Availability: Apple Dealers
Price: $250.00



I am indebted to our local Apple dealer, Computer World, for allowing me to preview the operation of the UniDisk 3.5 and ProFile under Apple Pascal 1.3.

Donald J. Geenen is the author of the recently published book "Learning Apple FORTRAN" (Computer Science Press; Rockville, Maryland; 1986). He also serves as the A.P.P.L.E. Co-op's FORTRAN consultant.

Donald J. Geenen

APPLE Pascal version 1.3, available as of December 10, 1985, is an impressive software package with an incredible amount of flexibility. It can function on an Apple II, Apple II plus, Apple //e, or //c, it allows 40 or 80 column operation, it supports 64K systems and 128K systems, and it can access 5.25 inch drives, the new 3.5 inch UniDisk, and hard drives like the Apple ProFile.

Purchasers receive the system files on four 5.25 inch disks (the now-classic APPLE0, APPLE1, APPLE2 and APPLE3), as well as on a *single* 3.5 inch disk (1PASCAL). The documentation is now provided in a single hard-covered, ring-bound manual. This review will begin with a discussion of the new manual, followed by a look at the operating system and language enhancements. A few minor complaints are registered at the article's end.

The Documentation

The new manual is divided into five sections (dividers are supplied to provide quick access to each). Following is a brief summary of the contents of each:

Part I : Getting Started (32 pages)

This section describes hardware support and configurations, system startup, disk formatting procedures, and how to make backups. It also compares the 64K system with the 128K system, and contains a summary of the system disks.

Part II : Program Preparation Tools (328 pages)

This is an updated version of the *Apple Pascal Operating System Reference Manual*. Experienced readers of the old manual will find many similarities between it and the new manual (some of the bizarre filenames like APPLE0:TUNAFISH.TEXT have carried over, as has the old "When you operate a skateboard in excess of 150 miles per hour . . ." example; you will still find the "Fully Annotated Graphics Program" complete with its disclaimer about not necessarily being well-designed, etc). I wondered whether this was due to a lack of inspiration, or if it was just a tribute to the former documentation. In any event, this portion of the manual is well-done and does document the new features of the operating system.

Part III : Language Manual (359 pages)

This section takes the place of the old *Apple Pascal Language Reference Manual*. If the new operating system manual seems to borrow heavily from its previous incarnation, the new language manual makes up for it ten-fold. Whereas its predecessor discussed only the *differences* between Apple Pascal and standard Jensen/Wirth Pascal, the new documentation is an exhaustive description of the language. You will find thorough descriptions of data types, program headings and declarations, variable scopes, recursion, variant records, pointer variables, and many other formerly neglected topics. Syntax diagrams, which I feel most people find quite helpful, are incorporated into the language description early on, rather than being tucked away in an appendix.

My impression is that the manual is more closely related in style to a textbook than to a reference manual. It is the type of document many of us yearned for when we were learning Apple Pascal (remember alternating between a standard Pascal text and the old language reference manual? I sure do!).

What the Experts are Saying About RamWorks II!®

"In an informal competition called '640K vs. 640K' AppleWorks running on a RamWorks equipped Apple IIe outperformed Symphony running on an IBM PC."

—InfoWorld

"AppleWorks wiped out Symphony... The competition was set up partly to show off another of Wozniak's favorite things, the RamWorks II memory expansion board from Applied Engineering . . ."

—San Jose Business Journal

"There are huge differences among the AppleWorks modifying programs sold with the cards. Without doubt, RamWorks II is the most powerful."

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—A+ Magazine

"RamWorks II is the most powerful auxiliary slot memory card available for your IIe, and I rate it four stars... For my money, Applied Engineering's RamWorks II is king of the hill."

—inCider

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Because RamWorks and Z-RAM have a mesmerizing list of characteristics that, as you use them, will change your perceptions of an Apple computer forever. Achieving a level of speed and performance most critics claim is the best they've ever seen. But we want to do more than impress the experts, we want to impress you!

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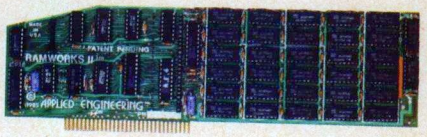

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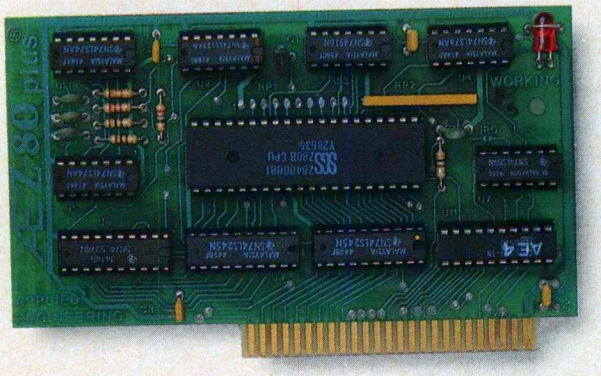

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CIRCLE 5 READER SERVICE CARD

Advanced programmers will appreciate some new chapters describing such techniques as improving execution speed and defeating Pascal's data typing. Also discussed are topics such as memory size allocations, assembly language interfacing with Apple Pascal (including detailed information about the stack and its contents, data representation, and parameter passing), large program management (segments, regular and intrinsic units, the new program library feature, and system swapping are covered), disabling system Control-commands, and direct memory access (you will find PEEK and POKE procedures, a screen dump routine, and learn how to read the hardware configuration from the SYSTEM.MISCINFO file). A small library of useful assembly language macros is included as well (popping and pushing stack parameters, removing the stack bias for a function call, saving and restoring the 6502 registers, and more). Shades of *Call -A.P.P.L.E.: All About Pascal!*

Part IV : Technical Reference (96 pages)

Contained herein is a list of useful memory locations (such as top of heap, top of stack, screen mode—40 or 80 columns, system version, and computer type, among others), declarations that provide the basis for accessing a disk directory from within a program, a discussion of the structure of text and code files on disk, detailed linker information, and an analysis of the P-machine and its instruction set.

Part V : Bibliography, Glossary, Index (44 pages)

Although the bibliography is unaccountably sketchy, the glossary and index are both very thorough.

A final note on the documentation. The Apple II and Apple II plus computers are still strongly supported in the manual. Conventions remain for 40 column use (CTL-A, CTL-Z) and simulated lower case (CTL-E, CTL-W, and the shift-key mod are all documented). A special SYSTEM.MISCINFO file is even included with the package for 40 column II/II + owners. One drive use is also thoroughly described. Apple Computer is often accused of stranding the owners of "outdated" or "under-equipped" hardware. Such is not the case with Apple Pascal 1.3, despite its being fourth generation software.

The Operating System Enhancements

System Startup

Apples with a 65C02 processor (*//c* or enhanced *//e*) can now boot Pascal from any type of disk drive in either slot 4, 5 or 6.

Editor

The Editor prompt line, formerly in alphabetical order, now lists the most frequently used commands first. Pressing "ESC" during a deletion is no longer the disaster it once was, since the aborted insertion is loaded into the Copy buffer. When you back through a file, you will find that a reverse scroll is now supported, rather than the annoying screen re-display every 12 lines. A case-change feature has been added to the X)change option. All prompt line occurrences of "ETX" have been replaced with "CTL-C" (finally!), although "DEL" has not been changed to "CTL-X," which is what it still means. In general, many of the prompt lines have been slightly re-worded; the Q)uit option, however, is worthy of special mention:

Quit:
To leave Editor, type
E)xit to main command line

To store Text file on disk, type
S)ave as PASCAL:PROGRAM.TEXT
W)rite to a new file name
U)pdate *SYSTEM.WRK.TXT

Let's compare Apples™ to Apples™.

An Apple IIc

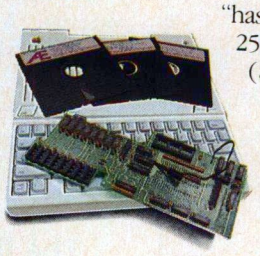
An Apple IIc with Z-RAM

The Apple IIc on the right works exactly the same as the Apple IIc on the left. Almost. The Apple on the right has a powerful memory expansion coprocessing card called Z-RAM. From Applied Engineering. Which means the Apple on the right can completely load AppleWorks into RAM—and then run it up to thirty times faster than the Apple on the left.

Z-RAM also acts as a solid-state disk drive. Which means the Apple on the right will load and store programs up to 30 times faster. And, our included RAM disk is compatible with Applesoft, PRO-DOS, DOS 3.3, PASCAL and CP/M.

Turbo Charged AppleWorks.

Even a 256K Z-RAM can completely load AppleWorks into RAM. With Z-RAM, the moment your fingers touch the keyboard AppleWorks responds. A 256K Z-RAM lets your IIc run AppleWorks up to 30 times faster, increases available desktop to 235K and maximum number of records from 1,350 to over 15,000, quadruples the number of lines allowed in the word processor, provides a print spooler, and auto-segments large files so they can be saved on two or more disks. A 512K Z-RAM boosts AppleWorks desktop to an incredible 425K.



Take a closer look.

There's more. Z-RAM has a built-in high speed Z-80B microprocessor that allows you to run CP/M programs. Which means you now have access to the single largest body of software in existence, including popular packages like WordStar, dBase II, Turbo PASCAL and Microsoft BASIC. A 16 bit option is also available.

And still more. Z-RAM is compatible with all IIc software and hardware, installs easily in just ten minutes with a screwdriver (slightly longer without), is available with 256K or 512K of additional memory (a 256K Z-RAM can be upgraded to 512K at any time). Z-RAM is easily handled by the IIc power supply with our patent pending power saving design.

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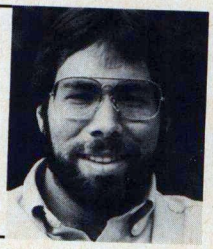
> *"I recommend Applied Engineering products whole-heartedly." (Of course, Steve's IIc has a Z-RAM installed.)*
>
> *Steve Wozniak, the creator of Apple Computer*



For fast response.

Z-RAM comes complete with simple instructions, RAM disk software, Z-80 operating system, CP/M manual. And a five year "hassle free" warranty. Make a good Apple great. With 256K Z-RAM "384K total" ($329); with 512K "640K total" ($389); 16 bit option may be added later ($89).

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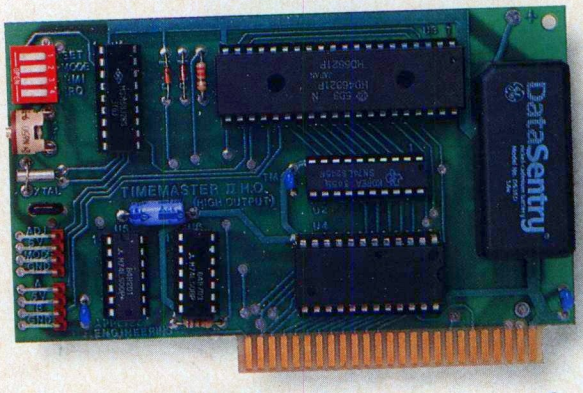

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To continue editing, type
R)eturn to same file
C)hange to another file

This more self-explanatory menu will be a boon to novice program users, and is long overdue. This menu is returned to after one chooses any of the saving options, which makes it possible, for example, to update the workfile frequently without automatically being returned to Command Level each time.

Filer

The Filer now provides full support of 5.25 inch, 3.5 inch, and hard disk drives. The same command set used for the traditional 5.25 inch drives also provides access to the high capacity drives. The Filer prompt line now has the most frequently used commands listed first, as per the Editor. The prompts are, for all practical purposes, identical to those of operating system version 1.2 (or version 1.1 with the screen width set to 80, instead of the default 79). One difference is that the V)olumes command now lists table headings, and also reports the number of blocks available for a disk drive device. It is impressive to see the Filer report 1600 blocks available for a UniDisk 3.5, and 9728 blocks (!) for a 5 megabyte ProFile (recall that 280 blocks is the norm). Finally, the Filer can now be chained to an executing file via the Chainstuff library unit.

Compiler

The major difference is that you must now specify the destination of the compiler listing file (or press "RETURN" to omit it). I have always found it cumbersome to insert a compiler directive comment into the source file, so I welcome this new feature. The compiler prompts have also been slightly reworded. Lastly, one can now include up to 254 functions and/or procedures per segment (149 was the former limit).

Linker

The Linker prompts have been made more self-explanatory. For example:

Link what host codefile?
Using what library file?

Assembler

The assembler now accepts standard 6502 indirect addressing notation (the former "@" notation is acceptable, as well). In addition, it now supports up to 50 procedures or functions per assembly.

Formatter

This utility will now format a disk in any Apple-compatible drive—5.25 inch, 3.5 inch, or hard disk. In each case the procedure is the same. An enhancement I find very useful is the ablility to name the disk volume at format time (rather than having it default to BLANK:).

New Utilities

The files 128K.APPLE and 128K.PASCAL become the SYSTEM.APPLE and SYSTEM.PASCAL files for 128K systems. A program called SET40COLS will alter the SYSTEM.APPLE file so that 40 column mode is enabled upon booting.

Other Utilities

The other Pascal utilities have all been retained, including LIBRARY, LIBMAP, SETUP, LINEFEED, BINDER, and others.

The Pascal Language Enhancements

The CASE statement may now include an OTHERWISE clause. This prevents one from having to use a decision after a CASE to intercept bad data that may have "fallen through".

Two new data types, BYTESTREAM and WORDSTREAM,

allow the passing of arrays of undeclared sizes to program modules.

The new low-level procedure UNITSTATUS can be used to determine if a given device is on-line (and if so, whether or not it is in a ready state), to check the number of blocks available on a given drive, and to find the number of characters in the type-ahead buffer.

Complaints

Hardware

The ProFile hard drive system can store a maximum of 77 files in its directory. This limit is the same as that imposed upon any other type of drive. Since a 5 megabyte ProFile has 9728 blocks of storage, each file must be 126 blocks in length for you to utilize it to capacity. I have not been able to determine if the disk is partitionable with the so-called Pascal ProFile Manager which is available for Apple Pascal 1.2 (this would allow support of up to 31 volumes per hard drive, each of which could be attached to any of 14 available units). According to the manual, the ProFile may not share the ProDOS and Pascal formats on the same rigid disk.

The 77 file limit is less constraining on the UniDisk 3.5, which has 1600 available blocks of storage. Capacity may be reached with files having an average length of 21 blocks. Apple *//e* and *//c* owners must get a ROM update to access a 3.5 inch drive. The *//c* cannot access a ProFile.

Operating System

Users of the 64K system must engage S)wapping from Command Level in order to compile even the smallest of Turtlegraphics applications.

The assembler still will only recognize constants beginning with a digit ("0FDED," not "FDED"). This is unforgiveable when you consider that hexadecimal is its default radix. In addition, base 10 values must end with a decimal point ("33.," not "33"). Lastly, pseudo-ops must still be prefaced with a period (".EQU," not "EQU").

Double hi-res graphics are not supported, although memory constraints may have made this impossible.

Documentation

The new manual is almost too bulky. It is difficult to move quickly between widely separated portions of it, even with the supplied partitions. The pages can become detached easily if you are not careful, since they are now bound by only three rings (16 and 24 rings were used for the old two-volume manual set; yes, I actually counted them).

Finally, absolutely no mention is made of Apple FORTRAN's operation under this system. Apparently, FORTRAN loyalists must fend for themselves. I also wonder if other languages will ever be supported by this awesome environment—how about COBOL, RPG III, Modula II, C, etc?

Update information

An update package is available for owners of older versions of Apple Pascal until May 31, 1986. You must send $125, along with your original APPLE1 system disk, to the following address:

Apple Computer Pascal 1.3 Upgrade
P.O. Box 306
Half Moon Bay, CA 94019

I at first balked at having to pay 50% of the suggested retail price for an upgrade, especially after having already paid the full $250 for Apple Pascal over 3 years ago. However, I was happy to learn that one could update from any former version of Apple Pascal (our school owned version 1.1). I also now reason that gaining support for high capacity disk drives is easily worth $41.67, that the new manual is a bargain at $41.67, and that the operating system and language enhancements are definitely worth $41.66. (Does that add up to $125? If not, we've been had.)

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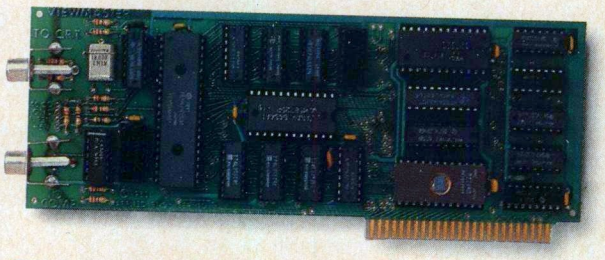

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CIRCLE 27 READER SERVICE CARD

Summary

If you are fond of Apple Pascal, you will find Apple Pascal 1.3 irresistible. The documentation ranks among the best I have ever seen. The flexibility of the programming environment is amazing. The transparent support of the new high capacity drives is perhaps the most important enhancement of this package. Except for an unusually high number of available blocks, you will notice no difference between accessing a UniDisk 3.5 or ProFile and accessing a 5.25 inch drive.

Although the Apple Pascal language and its operating system continue to evolve, all previously usable hardware configurations are still supported. Virtually all code from former versions will run without modification on the 64K system. This is an outstanding example of upward compatibility. Apple Pascal 1.3 could serve as a model of how product enhancements should be handled. Bravo!

Two Operating Systems Side-By-Side

Item	64K system	128K system
P-code space	38K (shared with data and 6502 code)	38K (independent of data and 6502 code)
Program data and 6502 code space	38K (shared with P-code space)	43K (independent of P-code space)
Editor space	17,920 characters (35 blocks)	32,256 characters (63 blocks)
Compiler symbol table storage space (with- out swapping active)	1,065 words	17,745 words
Maximum number of segments per program	32 (6 reserved for system)	64 (12 reserved for system)
Maximum no. of libraries with intrinsic units	1 per code file	6 per code file

Three Disk Systems Side By Side

Notes:
1. The system used was a 64K Apple IIe with the 65C02 enhancement
2. The times are reported in the form "minutes:seconds.hundredths"

Item	5.25 inch	UniDisk 3.5	ProFile
Drive capacity	280 blocks	1600 blocks	9728 blocks
Load filer	00:03.02	00:03.51	00:02.07
Load editor	00:02.91	00:02.83	00:02.28
Update a 4-line workfile	00:04.25	00:03.43	00:03.15
Run a 4-line workfile	00:19.04	00:17.79	00:10.00
Update a 610-line unit	00:08.58	00:07.81	00:05.52
Compile a 610-line unit	03:36.34	03:26.47	02:18.40
Format a disk	00:23.72	00:47.97	00:01.17
B)ad blocks scan	00:09.60	01:36.30	03:39.96

Observations:

In most cases, UniDisk 3.5 access times are slightly faster than 5.25 inch drive access times. The only exceptions are those commands which must operate on all the available disk blocks (formatting and bad blocks scan). This is natural since the UniDisk 3.5 has nearly six times the storage capacity of a 5.25 inch drive.

ProFile access times are the fastest of all, of course. Disk-intensive operations, such as compiling, widen the ProFile's margin over the other drives. Finally, the speed with which a ProFile is formatted is deceiving, since only the directory is formatted. The bad blocks scan gives a more realistic figure for the time required to access all disk blocks.

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Living Videotext	
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CIRCLE 23 READER SERVICE CARD

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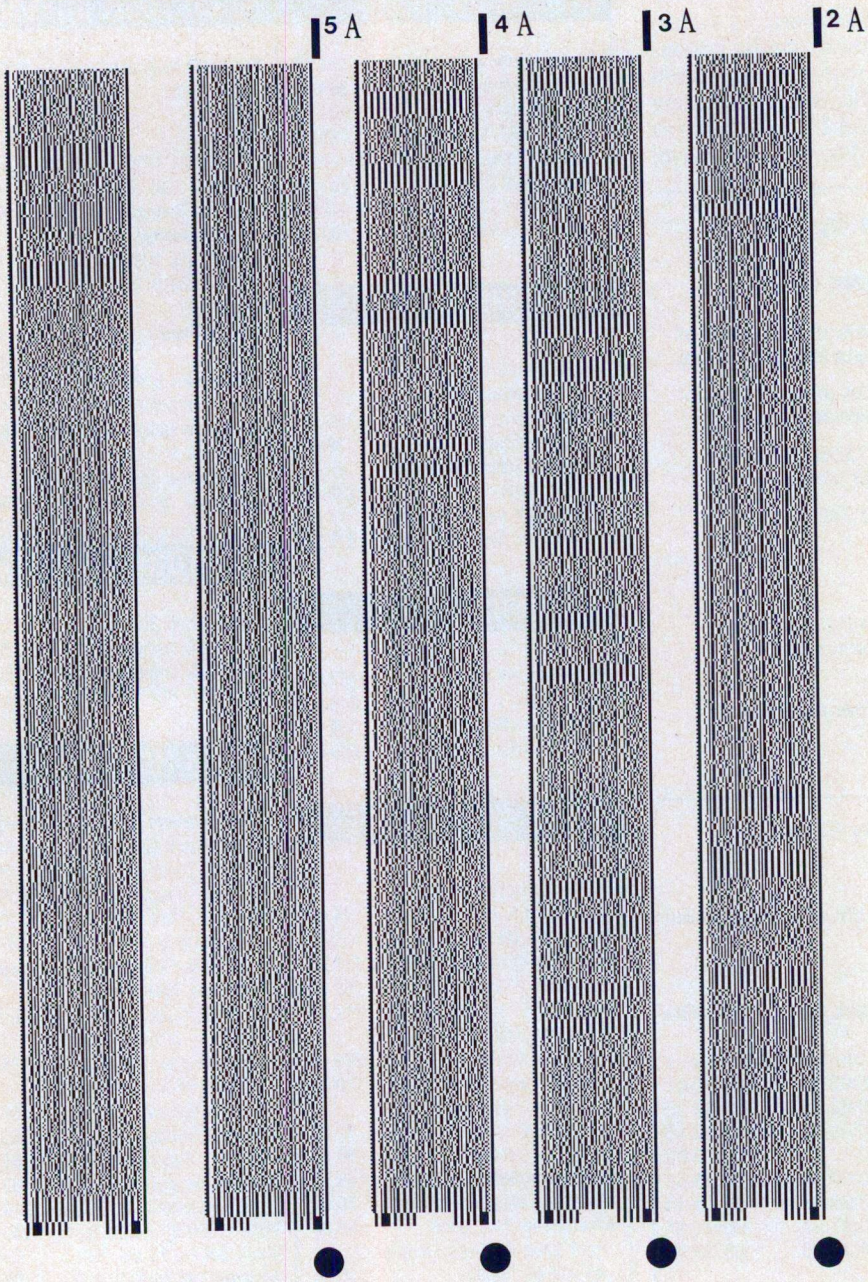

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Softstrip
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simulates a clock card on your Apple //c

B — MENU MAKER
a handy utility for writing single-key menus

C — CALENDAR
print out work week calendars

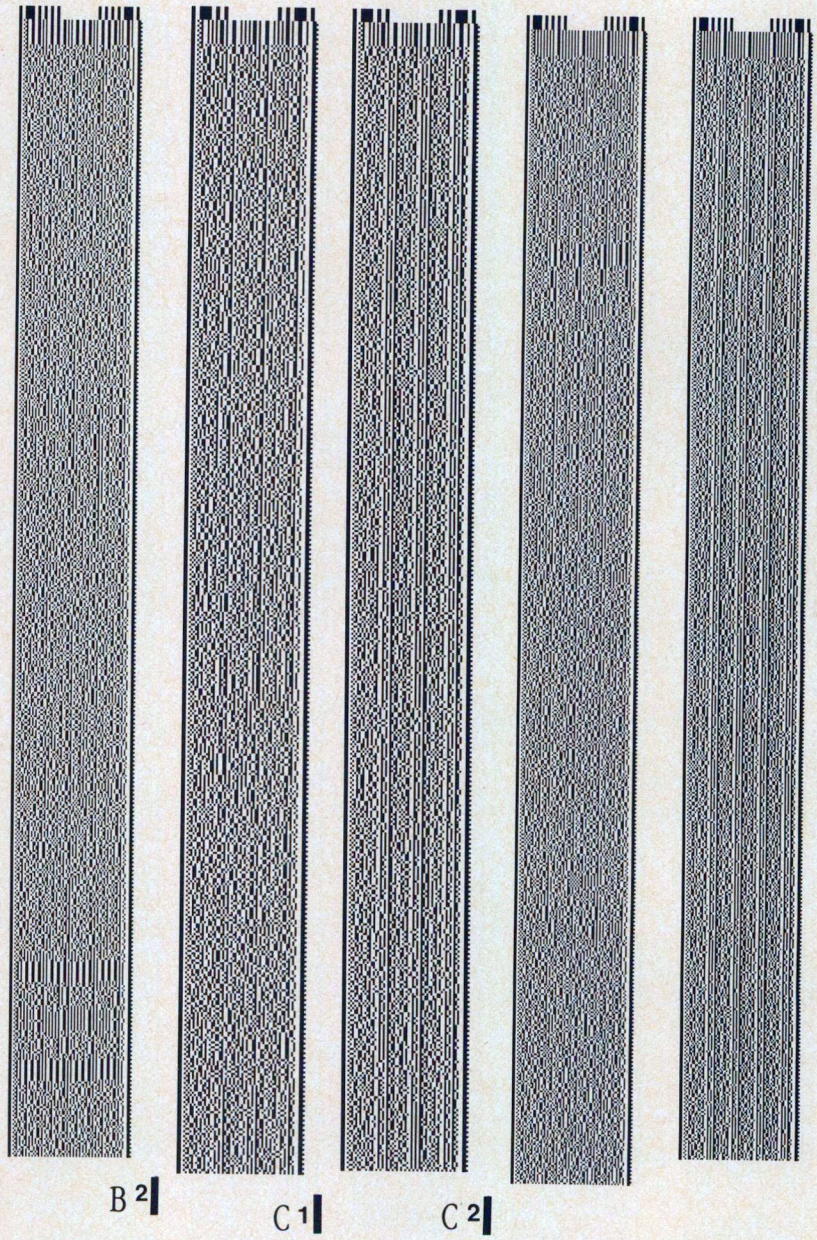
D — EXTENDED HELP
browse through ProDos HELP files

E — DEMO
learn how to print hi-res text and symbols

F — SKI GAME
hit the slopes with this action-packed challenge

G — HGR 2 PS
transfer hi-res images to Print Shop

H — MUSIC GRAPH
creatively combine sound and graphics



A 6 | B 1 | B 2 | C 1 | C 2 |

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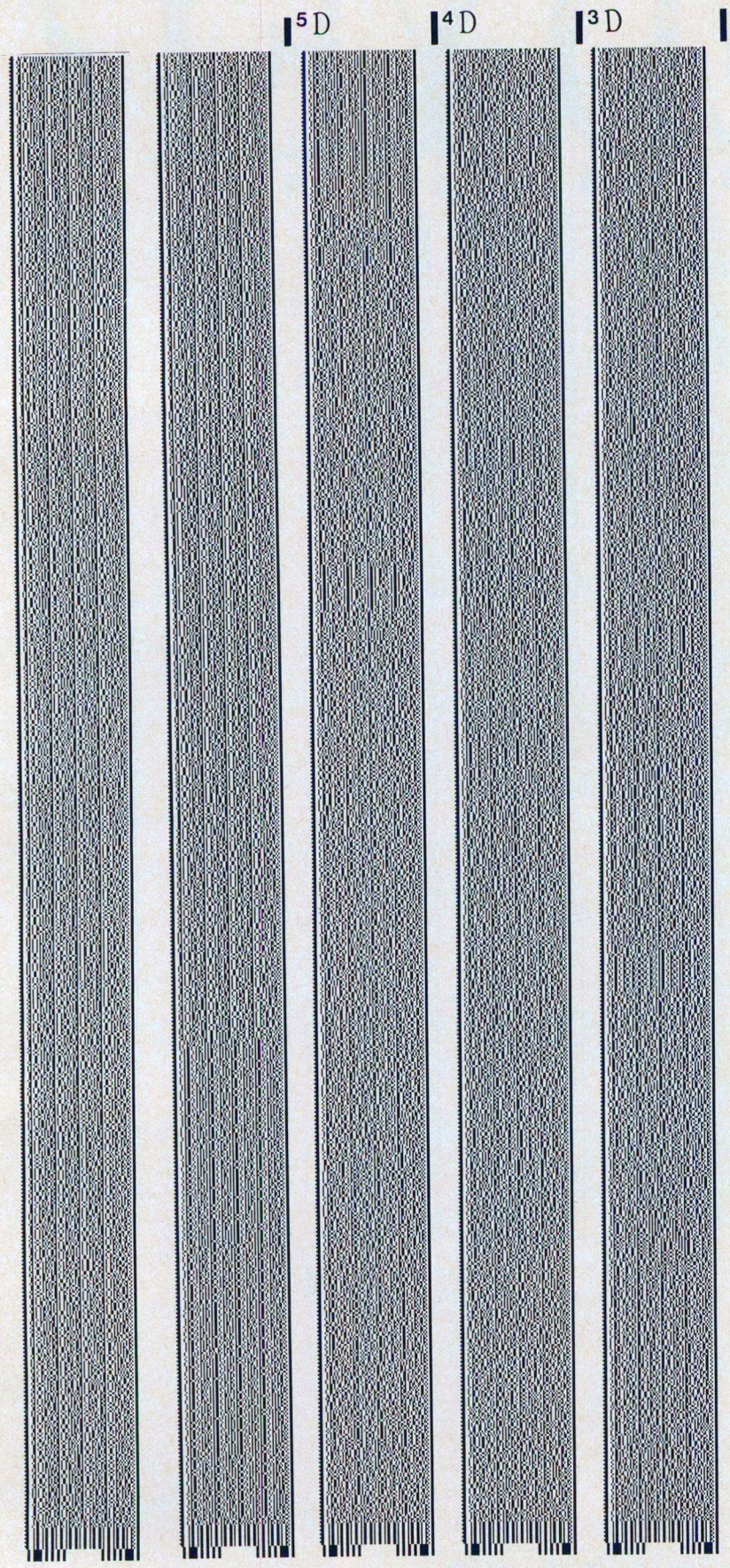

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(SUCH AS THIS ONE)

It's part of the expanding Cauzin StripWare™ Library containing programs, data, art, spreadsheet macros and templates. The Library features a variety of software applications and you'll find new material appearing each month in such leading magazines as A+, Call A.P.P.L.E., inCider, Nibble, and II Computing.

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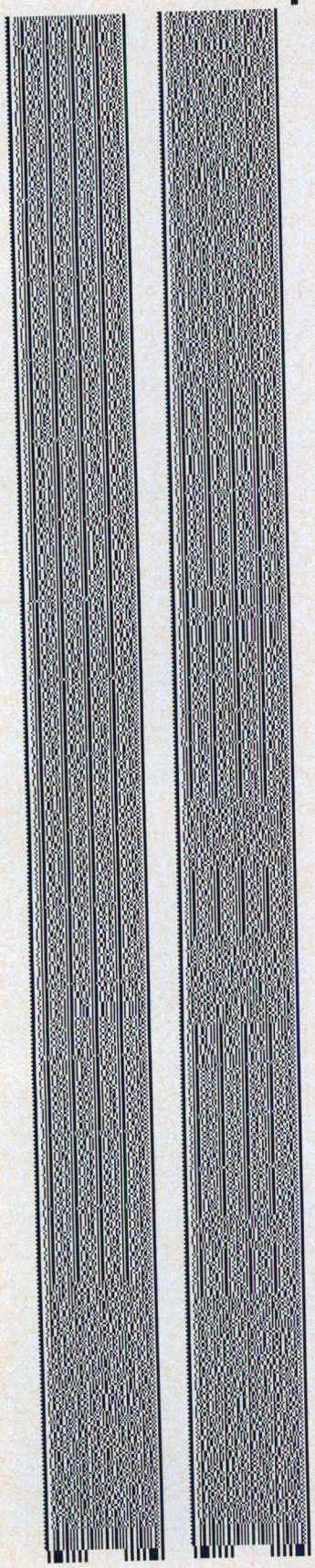

2 F

1 F

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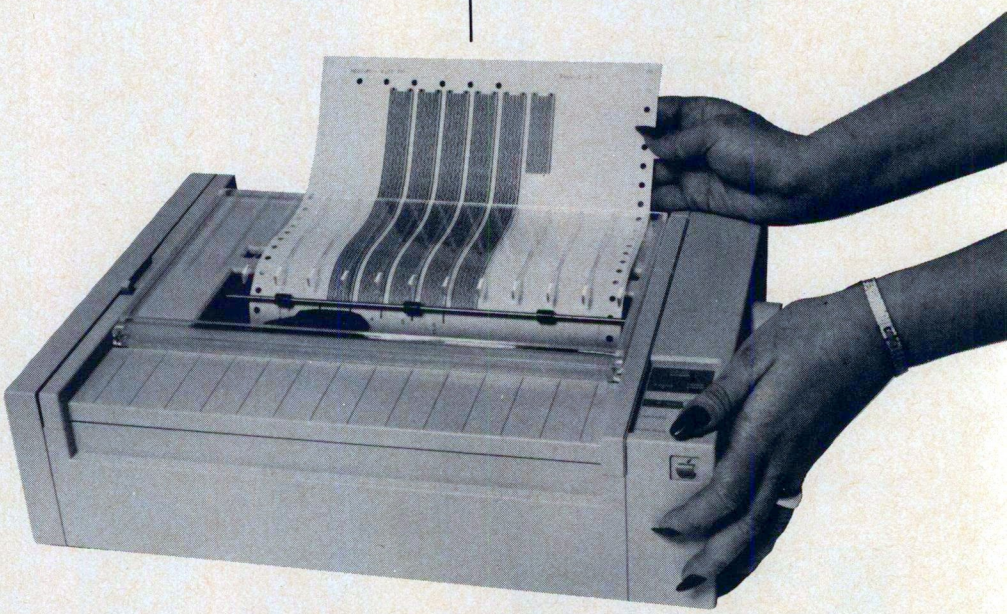

HOW TO STRIP

It's easy to read strips.

1) Just load Cauzin's communications software into your Apple.
2) Pick up the reader and lay it on the strip.
3) To the side of the data strip you'll see a black dot and a short black line (such as the ones found on these pages). These are your alignment marks. Place the reader so that its loop fits over the black dot and the edge of the reader just touches the black line.
4) Just press a single key command and then RETURN to "Read Strip".
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Treesearch for Pascal 1.3

David G. Sparks

PASCAL 1.3 is Apple's newest operating system for the Apple II family. As is true with all of their recent products, it is compatible across the entire range of machines, even back to the old, original II. My own II+ has a serial number in the low 5-digits, and Pascal 1.3 runs just fine.

I bought it because I had added a UniDisk 3.5 and one of Apple's 256K memory boards to my system. ProDOS welcomed both devices with open arms of course, but I also wanted Pascal to work with them. That was my principal reason for buying the Pascal 1.3 upgrade.

New Features

But more changed than just the disk device support in the new software. The Editor is clearly improved. I type faster than the Pascal 1.1 Editor could follow, but the 1.3 Editor keeps up effortlessly. Its Find and Replace operations are much faster. It allows somewhat larger files. The exit procedures are much more helpful, and already have saved me from a mistake in the tired hours of the night.

Pascal 1.3 is less fussy about where its parts are filed. The big benefit is that the major System files—the Editor, Filer, Compiler, Assembler, and Linker, together with their supporting files—can be run out of the RAM disk drive that Pascal 1.3 automatically installs in the new Apple II Memory Expansion Card. Compile time, probably the biggest point of grief and groaning about Apple Pascal, is greatly reduced when both the Compiler and the work files are in the RAM drive.

A Missing Function

But in every ointment there is a fly, and in Pascal 1.3 the fly may be the elimination of the TREESEARCH function. What's that, you ask? It is, or was, a specialized tool for locating data very quickly in a certain kind of memory scheme called (can you believe it?) a TREE. Oh sure, you say, you knew that quite well and were only testing my knowledge. But then, you may never have used TREESEARCH in any of the earlier versions of Pascal, so what's to miss?

First of all, there is a fine program in *Call -A.P.P.L.E. In Depth: All About Pascal* called "FORMAT." It allows you to make nice printouts of documents created in the Pascal Editor. As the program's author, Chris Wilson put it, Pascal has a very good Editor which only needed a good text formatting program to make it a complete word processing system. Wilson's program is a study in itself, because it really puts Pascal through its paces. The program uses the tree structure to process various formatting commands, and it does call TREESEARCH. As sold by A.P.P.L.E. Co-op, it will not work with Pascal 1.3.

A Revised FORMAT Program

Apple Computer, Inc. will supply TREESEARCH for Pascal 1.3 on a license basis. In other words, you pay extra for it. Nuts! The beauty of Pascal is that if you want a TREESEARCH and your version doesn't come with one, you can "roll your own."

This article will conclude with some additional discussion of binary trees, how to search them, and will suggest a form of treesearch function which might be more flexible than the one Apple Computer, Inc. took out of Pascal 1.3. Listing 1 is the proposed treesearch function customized for Wilson's FORMAT program.

Binary Trees

EXAMINE is a recursive procedure which follows a particular alphabetical rule in traversing a binary tree until it encounters either the key value being sought or a NIL node in its path. It sets the value of the variable parameter TWIG to the last non-NIL node in the path, and sets the value of RESULT according to these rules:

RESULT := 0	if the search value = key value of TWIG
RESULT := -1	if the search value was not found but belongs along the left-hand path from TWIG
RESULT := +1	if the search value was not found but belongs along the right-hand path from TWIG.

Trees grow. They are a special form of "linked list" using "pointers" to ordered chunks of data in memory. On the Apple they are by far most easily implemented in

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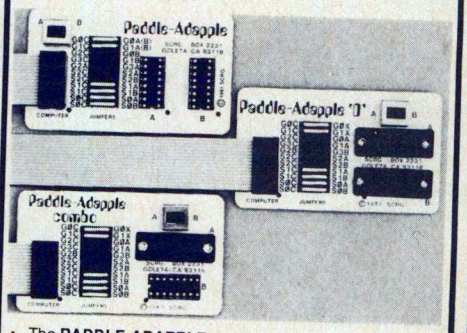
The are three versions to adapt to any combination of the newer type APPLE connector (the 9-pin D sub-miniature), or the older 16-pin plug.



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Pascal, though anyone who has played the ANIMALS program on the old DOS 3.3 master disk has experienced a disk-based tree structure. This article couldn't possibly afford a thorough discussion of trees. For that please refer to chapter 4 of *Algorithms + Data Structures = Programs*, the classic book by the father of Pascal himself, Niklaus Wirth.

Planting Trees

Trees can be set up many different ways. They are built of record-type variables containing at least one "key" data field of a type which can be evaluated by the logical operators (<, >, =, <>), plus two "pointer" fields that can be linked to other such records. There can be additional fields, and Pascal doesn't impose any particular constraints as to size or arrangement of the fields in the record. But to be compatible with Apple's TREESEARCH the first field has to be an 8-byte character array, followed immediately by the two pointers. The function is called with three parameters: a pointer to the first record from which to search, a pointer variable to be set to the record found by the search, and a string to search for. Being a function, it also returns a value of its own, which informs the program of the results of the search.

A limitation of the old TREESEARCH function is that its key field must be a packed array of characters (essentially a string), to the exclusion of other types. Of course with Pascal 1.3 an additional limitation is that it isn't available without extra expense! The proposed treesearch presented here imitates the old requirement only because it had to conform to a complex, previously written program which itself was designed to comply with the old requirement. As a practical matter, the proposed treesearch permits the key field to be of any ordered type. The key field need not be first, nor must the pointers immediately follow.

Just to make a point, the program below uses the same algorithm exactly, except the key field is an integer and comes after the pointer fields in the record definition. The program prompts for integers up to 8 digits in length. Each input value is automatically sorted as it is stored in the tree. After a zero or null input the program will traverse the tree, printing the numbers in numeric order.

I want to thank Apple Computer, Inc. for Pascal 1.3. I hope it sells as well as it ought, and pays them a well-deserved return on what was probably a healthy investment in developing this quality software product. Anyone who doesn't run it out of Apple's new memory board is really missing something nice. I offer my humble treesearch function as a christening gift, a sort of bottle-across-the-bow from an admiring amateur for the prosperity of this fine programming vessel and all who will travel its way.

LISTING 1

```
{First insert this in the global TYPE definitions:}

{TYPE}  a8 = packed array[1..8] of char;


{Insert the rest in FORMAT listing near the
 beginning, just before PROCEDURE UPSTRING}

function treesearch(root : entryp;
                    var twig : entryp;
                    id : a8)
                  : integer;

var result : integer;

procedure examine(var twig : entryp);

 begin  {examine}
   if twig <> nil then
     if id = twig^.name then result := 0
     else if id < twig^.name then
       if twig^.llink <> nil then begin
          twig := twig^.llink;
          examine(twig);
          end
        else result := -1
       else if twig^.rlink <> nil then begin
          twig := twig^.rlink;
          examine(twig);
          end
        else result := 1;

 end;  {examine}

begin  {treesearch}

    {TREESEARCH simply initializes the value of TWIG
    with the value of ROOT then makes the initiating
    call to EXAMINE.  It concludes by setting its own
    value to that of RESULT.  The value of TWIG is
    returned in the second variable of the parameter
    list of the calling statement.}

twig := root;
examine(twig);
treesearch := result;

end; {treesearch}

program number tree;

type a8 = integer[8];

     ref = ^node;
     node = record
              llink, rlink : ref;
              key : a8;
            end;

var temp, root, leaf : ref;
    value : a8;
    i : integer;
    back : string[9];
    numerals : set of char;

 function treesearch(root : ref;
                     var twig : ref;
                     id : a8)
                   : integer;

   var result : integer;

   procedure examine(var twig : ref);

   begin
     if twig <> nil then
       if id = twig^.key then result := 0
       else if id < twig^.key then
         if twig^.llink <> nil then begin
            twig := twig^.llink;
            examine(twig);
            end
```

```
            else result := -1
          else if twig^.rlink <> nil then begin
            twig := twig^.rlink;
            examine(twig);
            end
          else result := 1;

      end;

    begin  {treesearch}

    twig := root;
    examine(twig);
    treesearch := result;

    end;


    procedure printtree(node : ref);

    begin

      if node^.llink <> nil then printtree(node^.llink);
      writeln(node^.key);
      if node^.rlink <> nil then printtree(node^.rlink);
    end;

    function valid(var number : a8) : boolean;

      var digit : char;
          count : 0..8;
          positive : boolean;

      begin
        write('Enter a number (0 to quit):  [________]',back); (*
8 underlines between brackets *)
        count := 0;
        number := 0;
        positive := true;
        repeat
          read(keyboard,digit);
          if (count = 0) and (digit = '-') then
              begin
                positive := false;
                write(digit, '________',back); (* 8 underlines
between parenthesis *)
              end
          else if digit <> chr(32) then
           if not (digit in numerals) then write(chr(7))
          else begin
               number := (number * 10) + ord(digit) - ord('0');
               count := count + 1;
               write(digit);
               end;
        until (count = 8) or (digit = chr(32));
        writeln;
        if not positive then number := - number;
        valid := (number <> 0);
      end;

   begin   {main body of program}
     numerals := ['0'..'9'];
     back := '.........';
     fillchar(back[1],9,8);  {fill back with backspaces}
     root := nil;
     while valid(value) do
       begin
         new(leaf); leaf^.llink := nil; leaf^.rlink := nil;
         leaf^.key := value;
         if root = nil then root := leaf else
         begin
           i := treesearch(root,temp,leaf^.key);
           case i of
             -1 : temp^.llink := leaf;
              1 : temp^.rlink := leaf;
              0 : temp := leaf;

           end; {case i}
         end;  {else}
     end;  {while}
     printtree(root);
   end.
```


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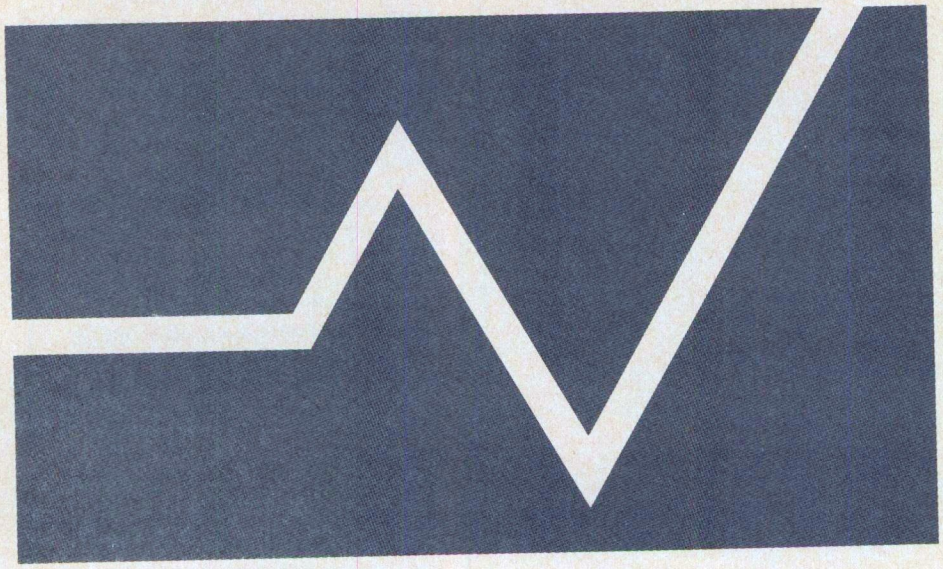

Bruce F. Field

PRINTER CONTROL WITH APPLEWORKS

Q. *I have a IIe, a Niceprint interface card from Spies Laboratories, and an Epson MX-80 printer with Graftrax +. This interface produces near-letter quality print on an MX-80, and can be activated using embedded printer control codes within a word processor document—I am using Applewriter IIe to write this letter. I would like to have the same print quality when using AppleWorks 1.2. However, I am not able to use the AppleWorks custom printer option to install my printer codes. This is because the Niceprint card requires, as an enabling (or initializing) command, a sequence that includes a caret (^). This must be entered before using the printer codes themselves. Of course AppleWorks recognizes the caret (^) as the signal to end a sequence of commands or control codes. Therefore I am unable to enter the proper enabling sequence, so I cannot set up the printer properly.*

A. As you are aware, AppleWorks does not allow you to enter control codes directly into the text of your document. Instead, these printer control codes are entered via the Custom Printer menus that permit any character to be entered *except* the caret. One way around this is to split up the printer control sequence so that all the control characters are included in the printer setup sequence, and the caret is put in the AppleWorks document itself. I do not know the Niceprint command sequence you want, but suppose it is as follows: ESC ^P1 (escape, caret,'P1'). The only actual control code here (with an ASCII value between 0 and 31) is the ESC; the others can be entered as standard text characters in an AppleWorks document. Therefore set up your custom printer choosing Boldface Begin (for example) and type ESC ^. (The caret is used only to end the sequence and is not included, of course.) Return to your document and select Boldface Begin (open-Apple-O, BB) and immediately after the newly inserted caret (indicating the Boldface Begin printer option), type ^P1. This second caret is an actual character and will be sent to the printer right after the ESC code sent by the Boldface Begin option. If you have more than one control character you may need to use two or more printer options with regular characters sandwiched in-between.

This method also provides a shortcut for extending AppleWorks' versatility in controlling the printer. For example, many commands for the Imagewriter printer start with the ESC code and are followed by standard text characters. If you define one of the printer options as ESC, you can use this in combination with text entered in the document to control forward and reverse line feeds, international character sets, slashed or unslashed zeroes, unidirectional or bidirectional printing, as well as the more conventional horizontal character spacing and print density options. One disadvantage of this method is that the extra added text characters will make that printed line too short as AppleWorks assumes they will be printed, whereas the printer gobbles them up and prints nothing. Applewriter has this same problem too, as all printer codes are entered directly into the text and counted as printable characters. Thus, if possible, you should put the commands on a line by themselves.

Version 1.3 of AppleWorks has been released and the major change is the ability to work with the new 3.5" disk drives. You can get a mailer from your dealer to return your original AppleWorks disks (and a check for $20) to Apple for an upgrade to Version 1.3.

WHERE IS THAT ENTRY POINT?

Q. *To DRAW a shape using machine language, many books give $F601 as the entry point for the Applesoft DRAW command. When I wrote a machine language program using $F601, it never worked. By trial and error I found the entry point is $F605. I herewith enclose a listing of the program I wrote. Why is it that so many books made the error in giving the entry point for DRAW?*

A. The entry point for DRAW depends on how you use it. The entry point at $F601 assumes that the address of the shape to be drawn, not the start of a shape table, is in the X and Y registers (low byte in X, high byte in Y) and the rotation factor is in the accumulator. The first two instructions of this routine store the X and Y registers in memory locations $1A and $1B respectively. With the registers set properly it will work fine, thus the books are not incorrect. Your program, on the other hand, puts the address of the start of a shape table in location $E8 and $E9 and calls a routine at $F730 to determine the start of the desired shape in the table. This routine does not leave the shape address in the X and Y registers as required by the routine at $F601, but puts them directly in locations $1A and $1B. Thus, as you found, you should skip the first two instructions in the DRAW routine (starting at $F605) to have it work properly.

REPLACING YOUR POWER SUPPLY

Q. *I've been having trouble with my power supply; it sometimes won't turn on. Once I get it to turn on it seems to run okay, so for now I leave it on all the time. I read on a local bulletin board that there is some capacitor, C7 or something that is probably the problem. Can you tell me how to replace this? Is it difficult?*

A. Difficult is in the eye of the beholder. First you turn off the power and unplug the connector on the motherboard that comes from the power supply. Turn the Apple over and remove the four screws from the bottom plate that hold the power supply and remove it from the Apple. Now drill out the rivets in the case of the power supply... Still interested? Actually the power supply in the Apple is a switching type power supply and is somewhat more

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difficult to troubleshoot than a traditional linear type and has dangerous voltages inside. Also, aftermarket (non-Apple) power supplies are available for less than $50, so I recommend you consider replacing the supply yourself. You just screw the new supply to the bottom plate of the Apple and plug it into the motherboard.

The power cord tends to work loose from the socket in the back of the power supply, so it's a good idea to make sure the plug is firmly seated in the power supply socket before looking for other problems. It's also possible that the switch is faulty. Once the computer is on and working satisfactorily, disconnect the power using another switch (on a plug strip) or by unplugging the Apple from the wall. If this cures your startup problem, consider replacing the switch. That is not too difficult after you get the power supply case open.

RUNNING OUT OF MEMORY

Q. *I am working with the 64K version of the Apple Pascal 1.2 language disk set. I am not familiar with Pascal but need this to copy Tom Woteki's Puffin program to disk (*Call -A.P.P.L.E., *Nov-Dec 1981). My problem is that I am running out of memory with a page or more of input remaining. Can I split the program up and join them later? Or, is there a way to get the Pascal 1.2 to access the 128K memory which my Apple IIe has available?*

A. I am a little suprised that you are having problems, as the source code for Puffin is 28 blocks long and the editor in Pascal 1.1 will handle up to 34 blocks of text. I don't have the numbers for Pascal 1.2 but expect it shouldn't be too much less. Anyway, you can gain a little more room by turning on the swapping option (S) from the Pascal command line. There are two levels of swapping, 1 and 2. In Pascal 1.2, level 1 frees up 2262 bytes and level 2 frees up 3084. Both of these options will cause the system to run somewhat slower as portions of the system are repeatedly loaded from disk as necessary.

You can also use the INCLUDE compiler directive to combine smaller pieces of source code. The *Apple Pascal Reference Manual* has a description of how this works. Basically (pun intended) you put the include statement in your source with the name of a text file. At compile time the compiler goes to this file and compiles the code just as if it were in the original file.

Another option is to use the 128K interpreter that came with the Pascal 1.2 system instead of the 64K interpreter you are currently using. This will automatically use your 64K extended memory card and will permit editor files up to something on the order of 60 blocks.

A third option is to purchase the source code already on disk. This is available from a users group, Washington Apple Pi, 8227 Woodmont Avenue, Suite 201, Bethesda, MD 20814. You want WAP disk 308, which sells for $9.00 including postage.

Mike Hartman (to whom I am indebted for the above information) also recommends that for serious work you get the Advanced System Editor from Volition Systems. This is a disk based editor and file size is not limited by RAM memory.

RUN A WIRE TO PIN 4

Q. *I have a well used Apple II+ with an ALS Smarterm II 80 column card installed, which I use with the Magic Window II word processor program. The Smarterm II works reasonably well except for the "one wire shift key" function which worked at first, but ceased abruptly one day. I would like to regain that capability, but have been hampered by the fact that the ALS company will not answer my letters or return my phone calls. I wonder if you can put me in contact with someone who might be able to help me with the problem.*

A. The "one wire shift key" modification involves running a wire from the shift key on the keyboard to pin 4 of the game port connector (push button 2) on the mother-

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All times in seconds. (Time Test programs available)		DAVID DOS-II	ProDOS	DOS 3.3
TEXTFILES (100 Sectors)	TSAVE	8.0	NO	NO
	TLOAD	6.2	NO	NO
(791 Strings,	WRITE	29.3	28.0	88.4
32 chars ea)	READ	24.3	16.3	83.8
	PRINT/READ	44.2	45.9	117.1
(442 Sectors, 7 x 500)	APPEND	142.3	142.9	1231.2
APPLESOFT (100 Sectors)	*SAVE	6.4	16.4	33.1
	LOAD	5.0	4.0	23.5
INTEGER (100 Sectors)	*SAVE	6.6	NO	33.4
	LOAD	4.9	NO	23.4
BINARY (100 Sectors)	*BSAVE	7.3	18.4	28.7
	BLOAD	5.8	4.8	24.5
48K PROGRAM SPACE	APPLESOFT	36,352	NO	36,352
(With 3 Bufs avail)	INTEGER	36,352	NO	36,352
	BINARY	36,352	34,816	36,352
64K PROGRAM SPACE	APPLESOFT	46,592	32,256	35,756
(With 4 Bufs avail)	INTEGER	46,592	NO	35,756
	BINARY	46,592	41,728	35,756

*Add 5 seconds for Verify. Apple II, Applesoft & ProDOS are trademarks of Apple

Ten New DOS Commands

1. HIDOS moves DOS above 48K memory.
2. FRE makes ultra-fast garbage collection.
3. DATE stamp files. Clock or manual dating.
4. TLOAD speed loads all Text Files to mem.
5. TSAVE speed saves Text Files from memory.
6. TLIST lists all Text Files to screen/printer.
7. DUMP Binary/Ascii to screen or printer.
8. DISA disassembles Binary to screen/printer.
9. AL prints program Address & Length.
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board. It's possible that this wire has worked loose, or you have recently plugged in a joystick or other device that also uses push button 2. First unplug anything from the game port other than the shift key wire, and see if that cures the problem. If not, you can perform a quick test in Applesoft to see if the modification is working properly. From the Applesoft prompt, type PRINT PEEK(49251) and hold down the shift key while you press the return key. The Apple should respond with a number between 0 and 127. Now do the same PEEK again, but this time do not press the shift key. The Apple should respond with a number between 128 and 255. If it does not pass both tests, then there is a problem with the wire or the connections to the wire. Review your Smarterm documentation to see how to connect it properly.

If the shift key mod is working properly, check to see if you must enable the shift key feature in Magic Window. Check the documentation for Magic Window to see if there is some mention of the shift key mod or look for a configuration setup feature.

DOS STORES EVERYTHING IN ASCII

Q. *I recently encountered an anomaly with the way DOS 3.3 saves TEXT files and I was hoping that you might be able to make a few comments about it in your column. The problem is not serious but it is strange. It appears that when a file is opened for writing, the first compound print statement encountered (i.e. PRINT W,X,Y,Z) causes the first three variables to be concatenated together in the text file. The elements W,X,Y can be numbers, numerical, or string variables—it doesn't matter. Subsequent compound print statements work just fine with each specified variable separated by a carriage return. The program and its output on the enclosed page demonstrate the point more clearly.*

A. Sorry, using your program I was unable to exactly duplicate your problem; I can *never* get compound print statements to work. However, I was caught in this trap a little while ago (in print yet!) and I believe I have at least a partial explanation for you. The first thing to remember about DOS 3.3 text files is that everything in the file is stored as ASCII characters. It makes no difference if you print a number as a number, X=11 : PRINT X, or print a string containing numbers, X$=STR$(X) : PRINT X$; in both these cases the file contains the two ASCII characters 177, 177. Also, the PRINT statement will put a carriage return (ASCII 141) after the 177's. If we use a compound print, e.g. PRINT 11,22 the file will contain the ASCII values 177, 177, 160, 160, 160, 160, 160, 160, 160, 160, 160, 160, 160, 160, 160, 178, 178, 141. The 177s are the 1's, the 178s are the 2's, and the 141 is the carriage return, but what are all those 160s?? They are spaces equivalent to spacing over to the next tab field on the screen. If you were to read this back using an INPUT statement with a string as an argument, e.g. INPUT A$, then A$ would contain "11 22." If instead you used a numeric argument, INPUT X, then X would contain 1122, because the string to numeric converter ignores spaces. The only safe way to use compound print statements is to explicitly print a delimiter, such as a comma, between the elements. For example, PRINT X;",";Y, with X and Y equal to 11 and 22 respectively, produces a file containing 177, 177, 172, 178, 178, 141, where 172 is the comma. This can be read back properly with INPUT X,Y or by executing INPUT X twice. All the ASCII values in DOS 3.3 text files are stored on the disk with the "high bit on"; this means that if you use a Disk Zap type program to inspect the disk (as I have done above) you will have to subtract 128 from the values before you can look them up in a standard ASCII code table. (See the back of the old *Applesoft Reference Manual*.) If you read the file with a GET A$ command, Applesoft will do the subtraction for you.

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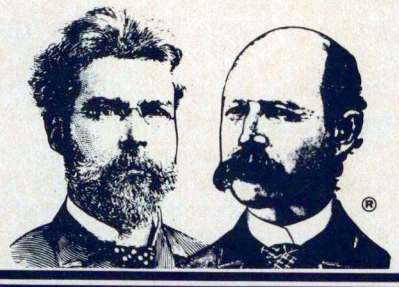

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1	ADDRESSES
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1	ALMOST
1	ALWAYS

1	WORK
1	WRITING
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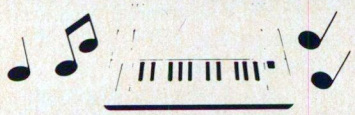

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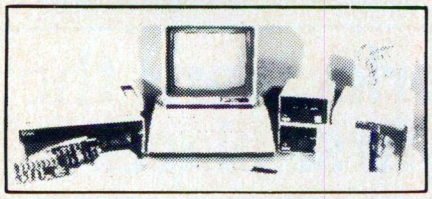

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Readers' forum

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```
10 PRINT CHR$(4);"BRUN
   GM":PRINT:PRINT:& CH(2):PRINT
   "SIZE 2":PRINT
20 & CH(3):PRINT "SIZE
   3":PRINT:PRINT "WHICH
   SIZE";:INPUT X:&CH(X):&CLS
```

This is suitable for the partially sighted students I have who can now learn some simple programming. It is also possible to use the large letters to write other programs.

The disk is so suitable that I will recommend it to teachers who have visually handicapped students in their classes. Because of time and difficulty in ordering the disk, I request that you make it available to Special Schools through myself or the Blind Institutions in each Australian State. Please let me know your thoughts on this matter or if you have other disks that are suitable for the partially sighted.

Congratulations and thanks for your magic graphics program.

Vin Hawley

Repairing An Old Printer

I own a NEC (Nippon Electric Co, Ltd.) PC-8023A-C Printer which I have been very satisfied with until the print head failed. The replacement cost was staggering at $414.00. The new printer cost several years ago was $525.00. The MX/FX Epson Print Head cost is only $52.00. I feel that NEC's price is way out of line. No response to my letter to NEC has been received to date. If a printer is this costly to repair, what would a complete CPU system or their new line of mass consumer electronic market items be?

Wm. Paul Morris

Installing ProDOS 1.1.1

I experienced the identical problem trying to install ProDOS 1.1.1 as Mr. Ratte (Write A.P.P.L.E. Jan 86) and solved it the same way by BLOADing ProDOS at 8192 since ProDOS 1.1.1 has a normal starting address of 0. This problem is solved with the new Rev. B support utilities from FCP. (You must order it. Price: about $20.00) The Rev. B support utilities always load ProDOS from the ProDOS partition. Don't be too quick to install ProDOS 1.2 Experimental though because BACKUP-II Version 1.0.1 (included with the Rev. B support utilities) will not run under this latest release. It must be run from ProDOS 1.1.1 or earlier. I had to set up a special menu program that loads the appropriate ProDOS version for the particular program to be run.

Robert E. Thorn

Fixing the Slide Show

I often use the slide show from Stowe Keller's article "Hi-Res Slide Show," December 1983 *Call -A.P.P.L.E.* This is a very nice program but unfortunately a couple of initial value steps were omitted. First is the low byte of the buffer address in the IOB (IOB+8). This must be zero.

The other problem is the X-register which must be 0 or 1. If the program is just booted and the "Flip Pages" option chosen then line 182, where the X-reg is set to 1, is bypassed so in line 191 we will access some wrong location. In one version of mine the X-reg always entered with the value $38 which enabled the language card! After the last picture was loaded, a call to monitor RDKEY in line 213 would hang the system requiring a reboot.

The following changes will fix both problems:

```
35 INIT LDX #0
36 STX FLAG
37 STX IOB + 3
```

and insert

```
38 STX IOB + 8
```

James E. McKay

A Disappointing Monitor

We received a copy of the following letter, written to John Sculley, President, Apple Computer, Inc.

Dear Mr. Scully: I am writing to you to voice my extreme disappointment with my Apple II A2M2010 monitor.

Three months ago my wife and I inherited a complete Apple *//e* system that my father-in-law purchased in 1984 but seldom used. We have been enjoying it ever since, and use it primarily with WordPerfect word processing software or Supercalc3a. Since inheriting it three months ago, we have been moderately heavy home users, working on the Apple most nights and during the day on weekends.

Last week, the monitor spontaneously began to malfunction. When the screen was on for many hours, the margins on both left and right sides enlarged and the top and bottom few lines disappeared altogether off the screen and the remaining lines on the screen became elongated or compressed. At first, turning the monitor off would solve the problem for a short time period. If the monitor were turned off for a few hours, we would get perhaps an hour of use when we turned it back on, but in a few days this recovery period steadily declined. Soon, the monitor began to malfunction with only a half hour of use, and turning the machine off and then back on again provided only a few minutes of relief.

Our dealer advised us that fixing the monitor would not be worthwhile since the labor would cost approximately $70 and a new part would be approximately $50. Instead, he suggested we purchase a new monitor for $129, tax, which we did.

I am angry that the first monitor was so poorly made that it malfunctioned after only about three months of moderate use. I am also angry that servicing your machines is so prohibitively expensive that consumers have no alternative but to buy new equipment once their warranties have expired.

I tried to call Apple today to see if there were any less expensive way to repair the monitor. Calling long distance from New York, I was connected to a tape recording from your customer service department and then ringing which lasted around ten minutes, at which point I hung up.

My original monitor, which probably needs only a minor repair, now lays totally useless in the closet and I am out $140. Dealing with Apple has proved to be a frustrating and unsatisfactory experience.

Victor L. Houser

Any Suggestions?

A comment by Bruce Field in A.P.P.L.E. Doctor (Oct 85) interested me. The problem he was dealing with concerned compatibility between the Grappler + and the Hayes Micromodem II. I have a compatibility problem with a slightly different combination of equipment—namely, the Grappler + and a Microcom ERA2 modem. For the last year or so, I have been using this modem and the ERA2 communication software bundled with the modem. The Grappler + is attached to an Epson FX-80 printer. The ERA2 software would not activate the printer properly. When trying to activate the printer from the terminal mode, the program bombed out to the monitor level and gave a register dump. The Microcom Support people did offer several suggestions to solve this problem. They also told me that ERA2 software did not support the Grappler + and that Microcom had no immediate plans to do so.

One of Microcom's suggestions was to try ASCII Express, Professional. They had heard it works with my combination. Since I do not yet have this program, I have not tried this solution.

A second solution they suggested works, but is only a partial fix. The HELLO program is written in BASIC. They suggested that I add a PRINT CHR$(4); "PR#1" to the HELLO program somewhere before it BRUN's the main ERA2 program. The printer can now be turned on and off from within the terminal program. But there are still a few bugs in this and I am hoping some readers or Bruce Field can suggest a fix for these bugs. Now when downloading text and simultaneously printing it, a carriage return/line feed is automatically inserted after receipt of about 258 characters. This can be annoying. Columns of data are rearranged, and paragraphs broken up. Later changes I made in the HELLO program to try to correct this, such as PRINT CHR$(9);"ON" or PRINT CHR$(9);

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S-C Macro Assembler — Version 2.0 is the latest in a long line of enhancements to the oldest commercially available assembler for Apple computers. Supports the full instruction set and all addressing modes of the 6502, 65C02, 65802, and 65816 processors, as well as Steve Wozniak's SWEET-16 pseudo-processor. Compatible with any Apple II, II Plus, //e, or //c having at least 64K RAM and one disk drive.

S-C Macro Assembler is well-known for ease-of-use and powerful features, rated number one by "The Book of Apple Software". You get an integrated editor/assembler with over 29 commands and over 20 directives including macros, conditional assembly, global search/replace, edit, and more. Thousands of users in over 30 countries and in every type of industry attest to its speed, dependability, and user-friendliness. S-C Macro Assembler blends power, simplicity, and performance to provide the optimum capabilities for both beginning and professional programmers.

Both DOS 3.3 and ProDOS versions are available now, $100 each; you can save by getting both together for only $120. Upgrades are available for owners of previous versions. Disks are not copy-protected, so you can easily make back-up copies.

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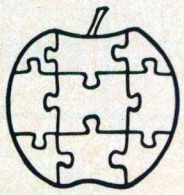

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"8S," seem to have no effect and printing seems to be controlled by coding within the main ERA2 program. If the text is captured to disk and then printed out, everything is printed as it should be. Does anyone have any suggestions as to why this is happening and any possible solutions?

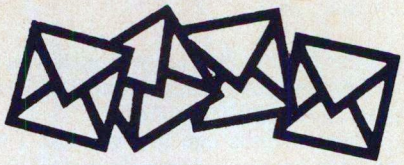
Jim Sims

Problems with the Controller Card

There is something exceedingly peculiar about the ProDOS that comes with Copy II Plus version 6.0. It will not boot (** UNABLE TO LOAD UTIL.SYSTEM **, RELOC/CONFIG ERR, etc.) on some machines (two different Apple II pluses) that I have tried it on, although those machines have been working fine otherwise. I traced the problem to the disk controller card! I found two disk controller cards that work fine with everything but this! One I tracked down to a particular 'LS323 & 'LS259 combination; the other I have not yet traced to the IC level. My advice to anyone encountering this problem is to first try a different 74LS259 (9334).

Keith Davison
239 Clinton Road
Brookline, MA 02146

LETTERS POLICY



Call-A.P.P.L.E. welcomes letters from its readers on any topic relating to the magazine's content, A.P.P.L.E. services, experiences with hardware and software, current issues in computing, or programming notes. Because of space limitations not all letters can be selected for publication or printed in their entirety, but we try to present a representative sample of your views. If you would like your address published, please include it near your signature.

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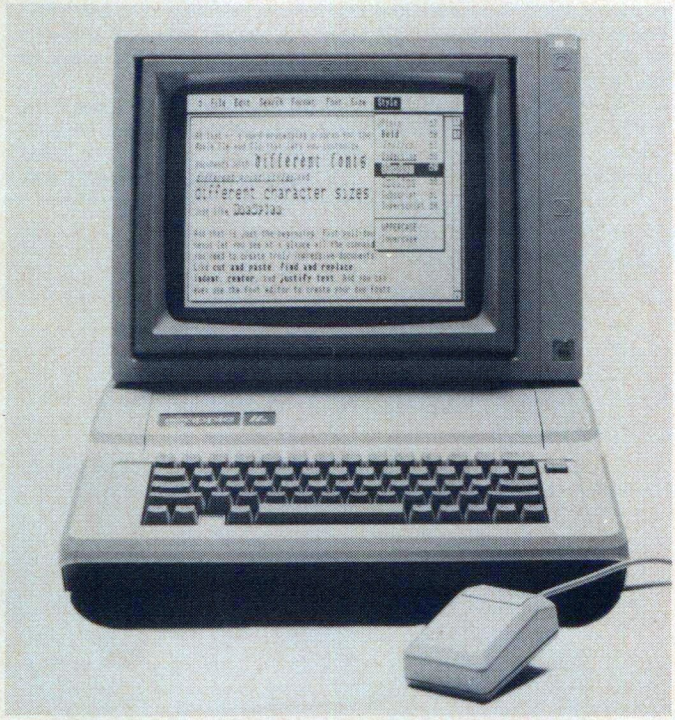
THE MARKETPLACE

The following items are selected by our editorial staff from the large number of product announcements and news releases sent to us daily. They are presented solely to keep you informed about the current market for Apple related hardware and software. As we have not tested many of these products, appearance here does not necessarily represent endorsement or recommendation by A.P.P.L.E. Further information about items appearing in The Marketplace can be obtained through the Reader Service Card. If you contact any manufacturers directly, please mention that you learned about them in *Call-A.P.P.L.E.*

WORDPROCESS LIKE THE MAC



StyleWare, Inc. of Houston, Texas is proud to introduce MultiScribe, a word processing program for the Apple *//e* and *//c* that offers users most of the advanced features of Macintosh word processors. MultiScribe uses the double high resolution screen available with the *//c* and *//e* (with extended 80 column card) as well as proportional character spacing to produce a full-featured word processor rivaling those available for the Macintosh for resolution, clarity, and ease of use. At an introductory price of $39.95, MultiScribe gives Apple II users Mac-like sophistication at a price below the average for a conventional word processor.

In keeping with Apple's human interface guidelines, MultiScribe features easy to use pull-down menus for command selection, scroll bars for scrolling quickly through text, and dialog boxes for extended functions (such as printing) and alert messages. MultiScribe is AppleMouse-based but not AppleMouse-dependent. Users without a mouse can use either the "keyboard mouse" (pull-down menus activated by the Esc and arrow keys) or open-apple control keys to select commands. Furthermore, mouse, "keyboard mouse," and open-apple control key command actions can be combined in any manner the user finds convenient. All commands and their open-apple keyboard equivalents are displayed on the pull-down menus.

Users are offered a wide variety of fonts, font styles, and font sizes, and all fonts appear on the screen as they will appear on paper when printed. For the first time Apple II users can mix different fonts in their word processing files and see the results on the screen! As with MacWrite and Microsoft Word, fonts can be "styled." Any font can be written in boldface, underline, italics, outline, shadow, subscript, superscript, uppercase, or lowercase, or any combination of the above. In addition, users can edit existing fonts, or create their own, by using MultiScribe's exclusive Font Editor.

Formatting text is done through the use of rulers. Users set tabs (up to 10 tabs per ruler) and margins as well as line spacing and text justification through controls conveniently located on rulers. To edit text, there are cut, copy, and paste functions similar to those found on most mouse-based word processors. Other features include:

- Find and Replace: allows the user to search for a particular word or group of words in a document and, if desired, replace it with another word or group of words.
- Invert Screen: gives the user the choice of screen with dark text on a light background or a screen with light text on a dark background.
- Print Merge: allows the user to link files together for printing as one extremely long file.
- Works with a variety of commonly-used printers.

Price: $39.95 (plus $3.00 shipping and handling). *StyleWare, Inc., 6427 Hillcroft, Suite 201, Houston, TX 77081, (800) 233-4088 (Outside Texas), (713) 771-4627 (In Texas).* **CIRCLE 41 READER SERVICE CARD**

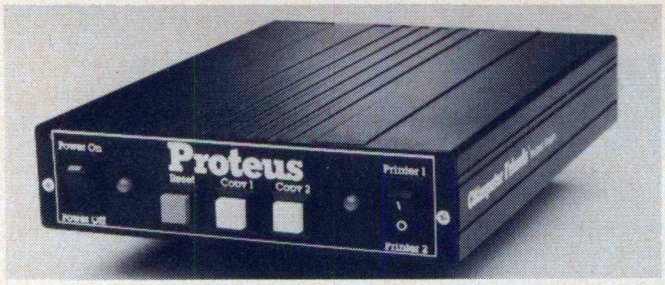
A NUMBER AND ALPHABET TOOL

CompuKeys announces its elementary and secondary level editions of its managed keyboarding package. The package consists of: The Alphabet Disks (eleven alphabetic tutorial lessons), Number & Symbol Disk (seven number and symbol tutorial lessons), and Management Disk (which saves students' scores and prints individual and classroom reports).

Unlike many of the earlier keyboarding software packages, CompuKeys is based on sound theory and research underlying the acquisition of keyboarding skills. The keyboarding package has many features, including: short lessons; content from a variety of fields; full-color, animated graphics; open exits from lessons; frequent lesson re-entry points; highlighting of errors for easy identification; instructional focus on self-competition; adjusting to individual skill levels; learning games integrated into lessons; numerous teacher options; sort options on class roster, records, and profile; and complete classroom management.

Individual disks may be ordered, or a site/district license may be purchased permitting unlimited duplication of disks for use within the specified site. Price: The two Alphabet Disks retail for $39.95. The Number & Symbol Disk retails for $39.95. If you purchase both, the price is $59.95. The Management Disk for records retails for $20 with each additional student disk $15. *CompuKeys, Inc., P.O. Box 8142, St. Paul, MN 55108, (612) 641-0039.* **CIRCLE 42 READER SERVICE CARD**

DOUBLE BUFFER AND DATA SWITCH



Computer Friends, Inc. announces Proteus, Parallel Double Buffer and Data Switch. Proteus incorporates into one compact unit the following features:

- Two parallel peripherals for any computer
- Flexible capacity buffer for each peripheral
- Hardware or software switching
- Multiple copy capability on each port
- One compact unit

Proteus incorporates into one unit 4 separate functions:

1. Buffer on port 1
2. Buffer on port 2
3. Manual Switching between port 1 and port 2
4. Software switching between port 1 and port 2

As a Data Switch, Proteus lets you connect two printers or other parallel peripherals to your computer. Typical applications include running drafts on one dot matrix printer and final copies on a letter quality printer, or loading one printer with letter size paper and the other with mailing labels or with 11" x 17" paper etc.

As a Multiple Copier on each port, Proteus expands the flexibility and productivity of your system. For example, you can set up one printer to print thousands of labels while still being able to use the other printer for other tasks.

As a Software Controlled Data Switch, Proteus lets you write a form letter, merge it with your mailing list, set up the printer with letter paper, the other with envelopes, press "start" and relax while the system does everything by itself.

Proteus is placed between your computer and your peripherals. Three female connectors are installed on the Proteus back panel (Centronics-36 pin). Price: $199.00 for 64K version and $299.00 for the 256K version. *Computer Friends, Inc., 6415 SW Canyon Ct., Portland, OR 97221 (503) 297-2321.*

CIRCLE 43 READER SERVICE CARD

LISP, THE LANGUAGE OF AI

Computer Science Press announces a new book, *LISP: An Interactive Approach by Stuart T. Shapiro*. The book offers a clear and concise introduction to the LISP programming language.

While LISP is the premier language of artificial intelligence, it has also become important in the study of programming languages, data structures, and symbolic mathematical computation. It is accessible and an interactive language. Unlike the imperative languages such as BASIC, FORTRAN, Pascal, etc., LISP is primarily a functional, applicative programming language, although it does contain imperative features. It is important for the new LISP user to become familiar with the applicative style before the two styles can be used in appropriate circumstances. Therefore, this book teaches only applicative (called 'pure') LISP until the last eight sections, when the imperative features are introduced. The book is organized into 32 brief sections, each of which is followed by a set of exercises that form a guided sequence of experiments with LISP. It can be used as a text, or for independent study with the user's local version of LISP as a reference.

CONTENTS: The Basics; Programming and Pure LISP; Programming in Non-Applicative LISP; Where Now?; Index. Price: $19.95. *Computer Science Press, 1803 Research Blvd., Rockville, MD 20850, (301) 251-9050.*

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* Note: Full compatibility with Applesoft programs. However, UniDOS 3.3 may not operate correctly with machine language utility programs that directly use DOS 3.3 internal routines. Apple and UniDisk 3.5 are registered trademarks of Apple Computer, Inc.

CIRCLE 29 READER SERVICE CARD

THREE LEVELS OF WORDPROCESSING

Writing Software International (WSI) announces the release of a new product called The BARD'S "Pro-Am" Apple *IIe/c* Writing System, and incorporates three levels of word processing in one product. The "Starter's" level is simpler than the Bank Street Writer and is designed for children and adult beginners. The "Experienced" level includes commands designed to allow users to "Cut and Glue," "Restore" and "Find and Replace."

The "Professional" level word processor includes all of the Experienced level commands, using the same format, plus such advanced features as "Quick Inserts" (macro glossary), destructive over-write and on-screen "Typesetting" of printer-supported fonts such as underlining, boldface and superscripting.

This feature is possible due to the Professional's support of over 30 popular printers which can be set up automatically through menu selection. Font codes for that printer are then automatically inserted into the text when a block of text is underlined or condensed through a "Typesetting" menu selection.

Also, both the Experienced level and the Professional have a built-in 50,000 word spell checker that is activated from the word processing menu and requires that only one disk swap be made to complete the spell checking operation.

Another advanced feature of both higher levels of the word processors is the View Page operation. This command allows authors to see a graphic depiction of exactly what their document will look like when it is printed out. This feature incorporates a cursor that can be moved through the graphic blocks representing the text so that when ESCape is pressed, the cursor will be at that position in the actual text of the document.

The BARD'S System also includes an animated graphic tutorial of how word processing works in general and an interactive tutorial of how the Starter's level word processor works specifically. It also includes a dictionary of terms and commands. Price: $69.95. *Writing Software International, 110 E. Broadway, Suite 600, Missoula, MT 59802, (406) 543-3141.*

CIRCLE 45 READER SERVICE CARD

CHILDREN LEARN LETTER FORMATION

Beginning writers quickly get the "feel" of correct letter formation with TOUCH 'N WRITE, a new Penmanship program which lets students practice handwriting directly on the computer screen. A complete 23-lesson curriculum based on the Palmer Method of manuscript handwriting, the program operates with the TOUCH WINDOW, a portable touch screen easily attached to the computer monitor.

Using their fingers, or the special pen included with the TOUCH WINDOW package, youngsters first learn to duplicate basic letter strokes. Next they trace and then "fingerpaint" letters in colors chosen from their own on-screen paint set. As students move from one section of a lesson to the next, they get rest and reward from short animations based on the theme of their choice--nature, fantasy or the circus. When a letter or number lesson is completed, they earn the special treat of being able to "touch 'n color" in an electronic picture book related to one of the three themes.

Teacher options include adjusting the curriculum so words children write correlate with their regular reading or spelling activities. The program can also be set to repeat a single lesson for all students. Designed to be used with the 64K Apple II computers. Price: $69, includes disk, backup and teacher's guide. TOUCH WINDOW hardware is required. *SUNBURST COMMUNICATIONS, 39 Washington Ave., Pleasantville, NY 10570, (800) 431-1934*

CIRCLE 46 READER SERVICE CARD

EASY GRAPHICS

The Graphics Magician Junior is the perfect graphics program for the novice computer artist who does not require the more advanced graphics capabilities that are available in Polarware's The Complete Graphics System and The Graphics Magician Painter and Animator.

The Graphics Magician Junior is simple to use; you just point at your choice of options and draw. With circle, triangle, box, straight line, and color-fill options, The Junior makes the computer do the work. Paint in any of the 108 available colors and patterns (256 colors and patterns for double high-resolution version) with a wide variety of computer "brushes." Once a masterpiece is created, it's a breeze to save to disk.

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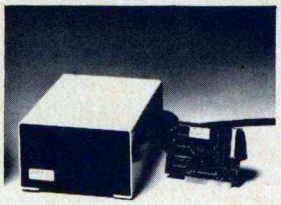

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CMC Computer Systems **Charles F. McConathy** **Phone: 714/835-2462**
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CIRCLE 15 READER SERVICE CARD

You may then choose to work on it later, utilize it in already existing programs, or simply display it for your own personal enjoyment.

All instructions are included on an easy-to-read poster. The program accepts input from keyboard, Apple Graphics Tablet, or any device that connects to a joystick or mouse port. Price: $34.95., *Polarware, 2600 Keslinger Rd., P.O. Box 311, Geneva, IL 60134, (312) 232-1984.*

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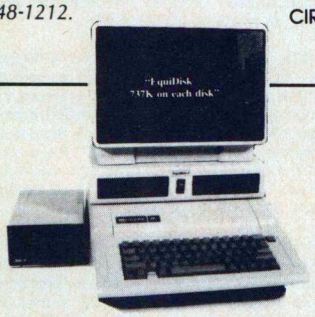

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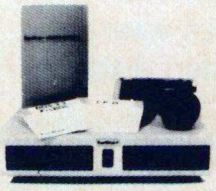

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Advertiser Index

Reader Service Number		Page Number
1,2,3,4, 5,6,7	Applied Engineering	2,3,31, 32,33,34, 35,68
9,10	Beagle Bros.	11,53
11	Blankenship & Associates	62
12	Cauzin Systems	40,41,42 43,44,45
13	CDA Computer Sales	54
14	Central Point Software	65
15	CMC Computer Systems	59
16	Coit Valley Computers	7
17,18	Computer Direct	16,17
19	David Data	52
20	Harvest Software	62
21	H & M Disk Drives	61
22	kyan software	29
23	Laing Electronics	39
24	Legend Industries	19
25	Memory Plus Distributors	56
26	MGR Software	10
27	Micol Systems	38
28	Micro Prose	49
29	MicroSPARC/Nibble	58
30	Nordic Software	49
31	Northeastern Software	36,37
32	Norwich Data Services	60
33	Pinpoint Publishing	67
34	SC Software Corporation	55
35	Silicon Express	51
36	Soft Wear Company	21
	Southern California Research Group	47
38	Titan Technologies	66
39	VF Associates	61
40	Vilberg Brothers Computing	56

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28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117
118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135
136	137	138	139	140	141	142	143	144
145	146	147	148	149	150			

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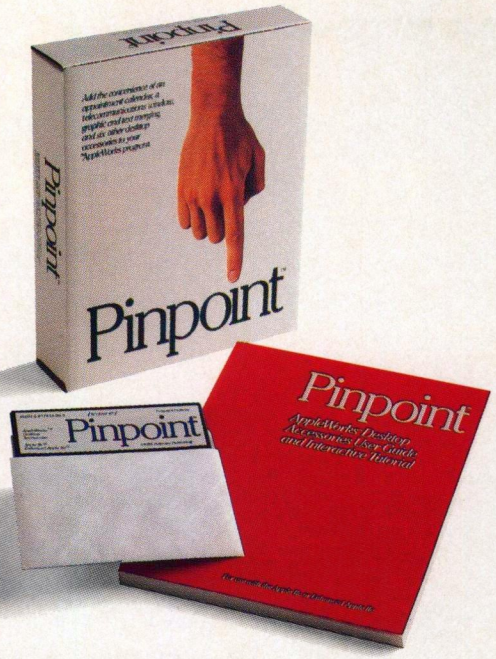

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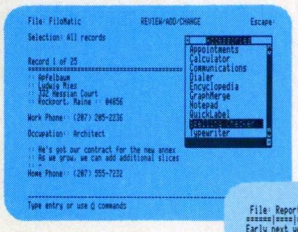

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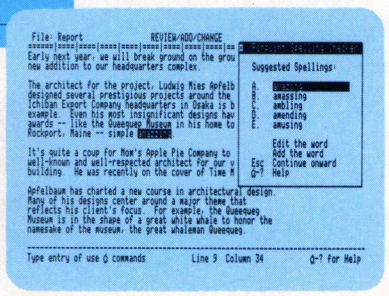

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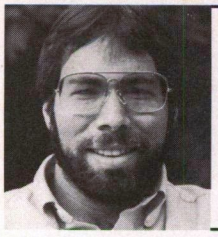

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